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The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington, D. C.

VOLUME XXVI NUMBER 8

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A GOOD PLACE TO DREAM OF THE FUTURE

Better Crops with PLANT FOOD

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VOL. XXVI WASHINGTON, D. C., OCTOBER 1942 No. 8

Let's understand—

The Farm Front

Jeff McDermid

BECAUSE the bread basket and the Corn Belt of America are so far removed from likely bombing forays, some folks have assumed that the farmers and stockmen of the fertile Midlands are unaware of war. Not only unaware and complacent, they affirm, but solely intent upon keeping the status quo in the cow country, harmony in the hog zone, and money in their jeans. Thus thinketh the critics.

That there may exist a beleaguered farm front with war risks and sacrifices sounds fantastic to those who seldom leave the pavements. What little they glean of trends and problems out in the plowlands comes from columnists or commentators, who revel in drivel about the farmer's callous indifference to the rising cost of food.

City citizens have witnessed brave displays of mechanical monsters and marvels as the big Army shows droned and clanked and boomed a chorus of conquest in rehearsal.

They perhaps overlooked the fact that among the Army's best mechanics and tank drivers, as well as in the Air Corps, are found boys who monkeyed with gas gadgets in field and furrow. They forget, or never realized, that the jeeps and motor guns are often operated by lads who got their training flat on their backs on the greasy floors of Pumpkin Center's implement and auto repair shop.

If they knew this, they would wonder maybe how the combines and the balers and the binders are getting along with-

out those sweaty rascals, or how Dad and old Uncle Jake manage to push the plow this year without those handy boys they have proudly donated to the Common Cause.

It all simmers down and sums up and jells together to this practical difference between the Government's war powers and the farmer's.

WITH the Army and the Navy and the Air Corps all the materials, equipment, and training is financed by taxpayers in a sort of cooperative public support.

With the farmer out there alone against the elements, rather fatigued and bewildered, and always shorthanded, the only finance in sight worth counting comes from the earning power of the soil, right from the grass roots.

When the general or the admiral wants something badly, his Uncle Samuel can dig up the credit and no further questions asked, and no personal responsibility.

When the farmer needs a loan for seed or fertilizer or a new storage house or anything from a mule to a mower, his collateral is scanned and his deeds and chattels and abstracts and promissory notes go under the shrewd scrutiny of private or cooperative agencies.

They want to know all about his alfalfa and corn crops since he quit the eighth grade, and the rate of gain on his shotes for a decade (if he could afford such a luxury) plus the production power of all his kin, including his wife's relations.

When the armed forces want to build a smokeless powder plant or an air school or anything useful for total destruction, they deal with contractors and in-between agents who lather on their overhead as guarantees against pecuniary loss.

When the farmer reads in his journal or listens by radio and the Secretary and others tell him to go right after a certain crop goal—what happens? Well he talks it over very briefly with the Missus between milking time and cockcrow, and she buys herself a new pair of overalls and patches up his, and that's all there is to it, until harvest time.

He "allows" or "expects" or "hopes" or "calculates" to render unto Caesar all that belongs to the campaign, or else bust a gallus and donate his Sunday leisure trying to raise the ante.

You never find him hedging and postponing the fulfilment of his high purpose by asking that every neighbor and every milk hauler or trucker handling his stock become a bona fide, fully paid member of the same organization he belongs to.

He rises with the sun, puts in more licks of hard work for his age and health than any cross-section of civilians extant, but expects no bonus for overtime hours. All he honestly wants in return is a little appreciation and maybe a few sops of oratory and rhetoric that call him the "salt of the earth and the bulwark of democracy." Farmers have taken their pay in praise as often as preachers have taken theirs in cord wood and vegetables.

IT IRKS him now to find a goodly segment of the city folks fed up daily on caustic comment that reflects no credit on the producer of raw food, that holds the farmer up to criticism as responsible for the lion's share of the boost in the consumer's cost of living.

With October the month of political speech-making wherein divers candidates will plead for the votes of their constituents, the farmer is wondering what kind of a medley of contrary argument will be voiced in the land.

In stumping for urban support no doubt much hue and cry will be raised about rising food costs and ways and means to be followed by public power in forestalling inflation. It will prove easier for the candidates to be consistent if their districts are either all urban or all rural. But the guy who wants to be sent back to Washington from a mixed district of producers and consumers is going to be as busy as a tightrope walker in a tornado.

Farmers will be watching the antics of candidates who cavort between the

city ward halls and the country town meeting places. Your true statesman placed in such a perilous and ticklish spot will, if he is honest, defend the farmers from the barbs of unjust enmity that have accumulated. For it will be wiser and safer for this nation if hatred and misunderstanding be eliminated. Just because the farmer works in a barn

is no reason why he is the only one to be "stabilized." He also has certain costs and living expenses to meet at a time when the demand on him for quality standards of output are higher than ever.

In the heat of current discussion of food costs I talked with many farmers at the autumn fairs. They almost invariably told me that the shibboleth of "parity" that wavers back and forth and up and down on paper in official files holds relatively small concern with them.

For the most part they confessed that during the recent mad rush to harvest grain and silage and fruits and vegetables, it was a weary and a tiresome thing to think about parity. Few could name any figure offhand that represented parity for their own particular commodity at their own special location.

But in a broad, general way they believed that parity meant fair exchange value, and as such it did mean something. Of course it did, because that is just what the producer has been flirting with for two or three decades. He may not be so sure that the so-called base period from which parity is calculated is the golden age of agriculture, or that many vague imponderables and complexities surrounding the farm front have been taken into full consideration.

Farmers are nothing if not realists. When we got too far into the muddle of economics, they led us back on firm ground by raising the potent and critical question whether agriculture might not find itself saddled and bridled but rather spavined and limping for the race which will be run on the "dirt" track in 1943. Much depends on the rules of the game they are forced to follow.

IN THIS race for production goals next season, the general idea is that the "old gray mare ain't what she used to be." At least she isn't feeling her oats like she did last spring.

In general, the 1942 crop season has been unusually bountiful. Men have told me they raised the biggest yields per acre this past summer that they had ever known. The background for this was favorable weather and improved soil fertility.

The wisdom of recent campaigns for balanced fertility throughout the Midwest has shown itself in a most critical hour. But the job in livestock production is not more than half done at harvest time. Judicious feeding and management are called for during the winter months, ceiling or no ceiling.

As winter approaches, I think more intently on what these fair-going farmers told me. In brief it sums up this way: The bounteous crops of 1942 were in a general way produced by elderly men, overworked housewives, juveniles, and imported city labor. The elderly men cannot be expected to do any better next year unless somebody injects them with mysterious elixir. The housewives have a limit on their stamina too, and the imported urban workers, no matter how willing, were at a handicap.

This leaves the juveniles. Boys of grade and high school age bore the brunt of it, assisted always by slack-clad farmerettes. The question is how soon and how fast will be the military call in beckoning the boys in their upper teens into armed services? As it stands now,

(*Turn to page* 44)

Clover Pastures for The Coastal Plains

By R. E. Blaser

Florida Agricultural Experiment Station, Gainesville, Florida

GROWTH of pasture plants on many Coastal Plain soils is limited primarily by the low fertility level of the soil. The soils are primarily deficient in nitrogen, phosphorus, potassium, and calcium. Recent tests also show that certain of the minor elements may become limiting growth factors on some soils after lime and complete fertilizer have been supplied.

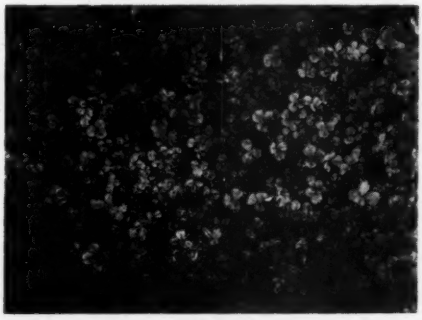
Nitrogenous fertilizers are the most expensive nutrients required for pastures, and plant growth is often limited primarily by the deficiency of this element in the soil. The best method of supplying nitrogen to pastures is through a legume program. Legumes, such as clover, possess root nodules which fix nitrogen from the air for themselves and also add nitrogen to the soil for associated grasses. The herbage of pastures which are made up of a mixture of grasses and legumes is higher in minerals, protein, and vitamins than herbage from grasses alone.

Legumes should also be used for pastures to aid nitrogen conservation in connection with the war effort.

The purpose of this writing is to discuss briefly methods used for growing and perpetuating clovers in Florida.

The Coastal Plain soils which are best adapted for growing clovers include low moist soils with six inches or more of dark surface soil, high in organic matter. The fine-textured soils are preferable to the coarse-textured soils. Soils in these categories have a higher base exchange and water-holding capacity than sandy soils low in organic matter. The most productive pasture soils in the Coastal Plain group in Florida include Bladen, Portsmouth, Plummer, St. Johns, and certain types in the Leon series.

The variety to plant depends primarily upon soil moisture conditions and to a limited extent on soil texture. Louisiana white and Persian clovers furnish best grazing on low moist soils which may be considered too wet for cultivated crops. These soils are generally high in organic matter. California bur, Black Medic, Crimson, Hubam, and other sweet clovers grow best on soil which is fair to well drained.



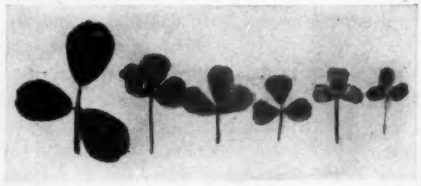


Fig. 1. Potassium Stimulates Clover Growth. Above, a mixture of Louisiana white and California clovers showing dwarfed growth and potassium deficiency symptoms. Typical potassium deficiency symptoms of white clover display a distinct spotting of leaves and also burning of leaf margins, when the deficiency is acute. Below, potassium deficiency symptoms of California bur clover. A normal leaf is shown on the left.

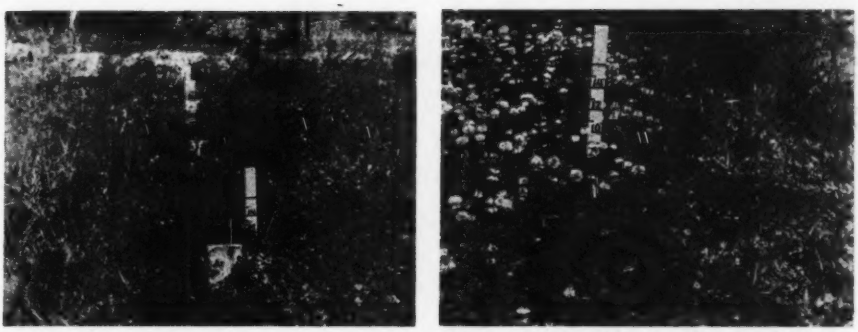


Fig. 2. Thorough Inoculation and Proper Seeding Technique Insures Clover Stands and Growth. The luxuriant growths, California bur clover (left) and Louisiana white clover (right), were inoculated at five times the rate recommended for commercial culture. The areas showing poor growth had uninoculated seed. The good nodulation and growth may also be attributed to the favorable soil moisture when the clovers were seeded.

Hop and Hubam sweet seem to be widely adapted and Black Medic and Hubam sweet clover are more drought-resistant than other clovers. It is advisable to plant a mixture when it is not known which clovers are best suited to the environment in question.

The lime and fertilizer practices for establishing clovers depend upon the variety. The clovers may be divided into two groups from the standpoint of fertilizer requirements. The Medicago-Melilotus group (Black Medic, Hubam and other sweet clovers, and California bur) requires more calcium but less phosphorus than the Trifolium group (White, Crimson, Red, Hop, and Persian clovers). Since the Medicago-Melilotus clovers require more calcium than the Trifoliums, ground (Calcic) limestone has been more satisfactory than dolomitic limestone for this group. The Trifolium clovers may be fertilized with either dolomitic or calcic limestone at the rate of one ton per acre. White, Persian, and other Trifolium clovers treated with high calcic limestone have generally given as good or better growth than those which received dolomitic limestone. The varieties of either the Medicago-Melilotus or Trifolium groups were higher in calcium content when treated with ground limestone than when treated with dolomite.

Liming is also necessary because it improves nodulation. Without lime Medicago-Melilotus clovers were very poorly nodulated, but the nodulation of the Trifoliums was also improved greatly when lime was applied.[1] The Medicago-Melilotus clovers invariably fail in the absence of lime, and the Trifoliums fail on the more acid soils when lime is not applied. Lime has stimulated growth greatly on all soils tested with the exception of the Parkwood series, which is generally underlaid with marl. The element magnesium, supplied by dolomitic limestone, has not yet been found to be a limiting growth factor.

In addition to lime, clovers require phosphorus and potash. Four hundred to 600 pounds per acre of 0-14-10 or similar fertilizer has supplied the phosphorus and potassium needs satisfactorily. For Medicago-Melilotus clovers the P_2O_5 may be reduced if desired.

When phosphorus was omitted from the lime and fertilizer treatment, the clover plants were extremely dwarfed and purplish-green in color (Phosphorus-deficient). These plants were also low in phosphorus content when compared with plants that received phosphorus.

The omission of potash from the lime and fertilizer mixture resulted in potassium-deficiency symptoms and inferior growth. Potassium-deficient plants of white clover possessed spotted leaves

[1] Blaser, R. E., Volk, G. M., and Smith, F. B. The Yield, Composition, and Nodulation of Several Clover Varieties as Affected by Sources of Calcium and Phosphorus in Combination with Other Fertilizers on Several Soils. Soil Sci. Soc. of Amer., Proceedings 16, 1941.

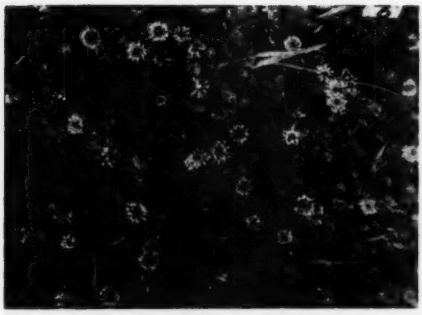
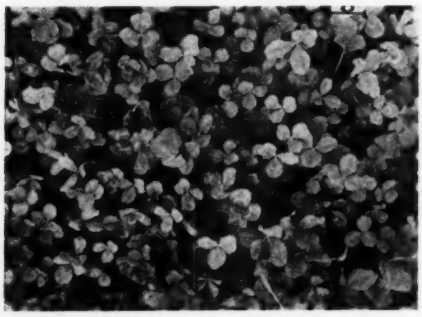


Fig. 3. Plant Adapted White Clover Strains. Above, Louisiana white clover is a tall, vigorous strain which seeds prolifically.



Ladino clover is a high-yielding clover but not satisfactory because of its poor seeding. The white clovers behave as perennials and fall annuals, thus good seed-producing varieties are essential.

New Zealand white clover (typical of Kent Wild) which produced inferior growth and is also a poor seeder.

and the leaf margins were brownish when potash deficiency in the soil was acute. The potassium-deficient leaves of California bur clover were yellowish and also had burned leaf margins, but leaf spotting was generally absent (Fig. 1).

The fertilizer practices on soils that have been fertilized before establishing clovers depend upon the fertilizer applied for previous crops. Fair to good clover growth may be anticipated without fertilization on heavily fertilized soils that have been used for truck crop production. However, these soils have generally been found to be high in phosphorus, thus the clovers responded primarily to lime and potash on these soils.

The Trifolium and Medicago-Melilotus or related clovers do not occur naturally on the Coastal Plain soils. To avoid failures it is thus necessary to inoculate all clover seed thoroughly (Fig. 2). Tests show that inoculation rates at five times the rate recommended for commercial inoculants give rapid nodulation and thus excellent stands and growth of clover the first year it is planted. The desirability of using heavy inoculation rates is substantiated by the good results which have also been obtained by farmers when following this technique.

The following inoculation technique has been recommended and used by farmers. Syrup is added to seed and mixed until all the seeds are coated. The proper culture is then added and mixed thoroughly, after which peanut or cotton-seed-meal is supplied until the seeds separate. If clovers requiring two kinds of culture are used as a seed mixture, they should be inoculated separately to concentrate the bacteria on the seed of its symbiotic host.

Prevailing soil moisture conditions during seeding time influence nodulation greatly. To insure good nodulation the soil should be moist and well packed before planting clovers. Plantings made in dry soil with prolonged dry periods have failed because of inferior nodulation. In Peninsular Florida clovers grow successfully if planted any time when the soil moisture conditions are favorable, within the period of October 15 to January 1.

If the clovers are planted during apparent favorable moisture periods and the soils turn very dry, it is advisable to reinoculate the clovers. Clovers that have already been planted may be reinoculated by sieving soil which has

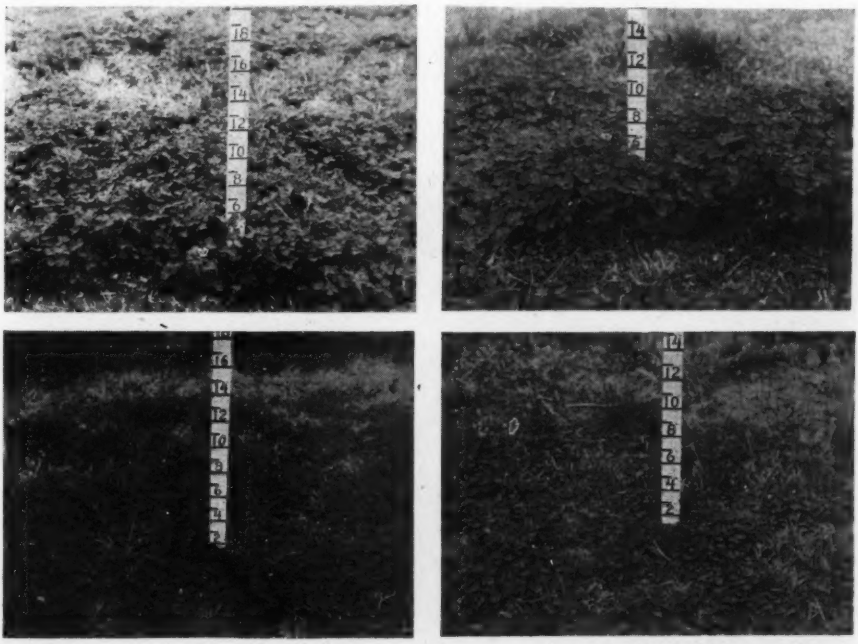
grown clovers and adding commercial culture. The fineness of the mixture aids dissemination so most of the seedlings are contacted with the culture. Such a mixture was broadcast from a truck during a rain at the rate of 500 pounds per acre on clover planted during a dry period. The resulting growth and nodulation of clovers was excellent (Fig. 6).

Clovers may be seeded on newly prepared seedbeds or on established grass sods. On newly prepared seedbeds best growth occurred when the seedbed was prepared well in advance of planting time to allow time for the soil to become firm. Surface broadcast seed planted during a rain or seeding with immediate rolling has given excellent growth.

Excellent stands and growth of clovers have been obtained on test plots and farms when seeded on established grass sods without disturbing the grasses. When this planting technique is followed, the grass should be closely grazed and the seed broadcast during a rain. Failure resulted when the grasses were not closely grazed.

Of the many clovers tested, white clover is the most important variety. Louisiana white and Ladino clovers produced higher yields than other clovers. Ladino is not recommended because it does not reseed itself satisfactorily. Strains of white clover from England and New Zealand were found to be dwarfed types and low in productivity (Fig. 3). Several white clover strains from the northern part of the United States were found more vigorous than the imported varieties, but these were inferior to Louisiana white. Recent tests also show that other clovers in a species group differ greatly in growth, characteristics, productivity, and behavior.

Clovers, like other crops, require certain definite fertilizer and management practices. Annual top-dressings of fertilizer have proved necessary on some



Black Medic Louisiana White Clover

Fig. 4. Annual Fertilization Increases the Earliness of Clovers. All clovers were fertilized with an initial treatment of one ton of lime and 600 pounds of 0-16-8 fertilizer. An application of 300 pounds 0-16-8 fertilizer applied in the subsequent October increased the early season yield of black medic and white clover greatly (above photographs). Typical clover growths without refertilization are shown in lower photographs. The pictures were taken in February.

TABLE 1.—THE CHEMICAL COMPOSITION OF CLOVERS IS IMPROVED GREATLY BY FREQUENT FERTILIZATION*

Lime and Fertilizer Treatment Pounds Per Acre—1939	Chemical Constituents in Per Cent of Dry Matter				
	Calcium	Phosphorus	Potassium	Magnesium	Protein
None	1.03	0.29	1.33	0.43	22.6
500 pounds ground limestone and 150 pounds 0–16–8	1.43	0.38	1.62	0.43	27.6
1,000 pounds ground limestone and 300 pounds 0–16–8	1.48	0.46	1.84	0.46	28.2

* All plots were fertilized uniformly with 1 ton dolomite and 600 pounds 0-16-8 fertilizer in October 1937.
NOTE: The soil was a virgin Leon fine sand.

soils and desirable on others. Two hundred to 400 pounds of 0-14-10 or similar fertilizer applied annually produced earlier grazing as well as more feed (Fig. 4). The herbage of clover which was fertilized annually was also higher in calcium, phosphorus, potassium, and nitrogen than the unfertilized clover (Table 1).

The best grazing management practices of clovers are not definitely known, but it appears that grazing in late winter or early spring should be withheld until the clovers are well started (two to four inches in height). Light grazing during June facilitates seeding for next fall's volunteer growth or for harvesting of a seed crop. In the fall the sods should be in a closely grazed condition so grasses do not compete with the volunteer clover plants and seedlings (Fig. 5).

In October 1940, a 10-acre area of carpet-grass pasture was divided into four pastures of two and one-half acres each. Two of the pastures were fertilized and seeded with a mixture of Louisiana white, Black Medic, and California bur clovers. Because of the dry season the clovers were not ready for grazing until April 1941. These two clover pastures produced an average of 330 pounds of beef per acre in 1941. In November

(*Turn to page* 41)

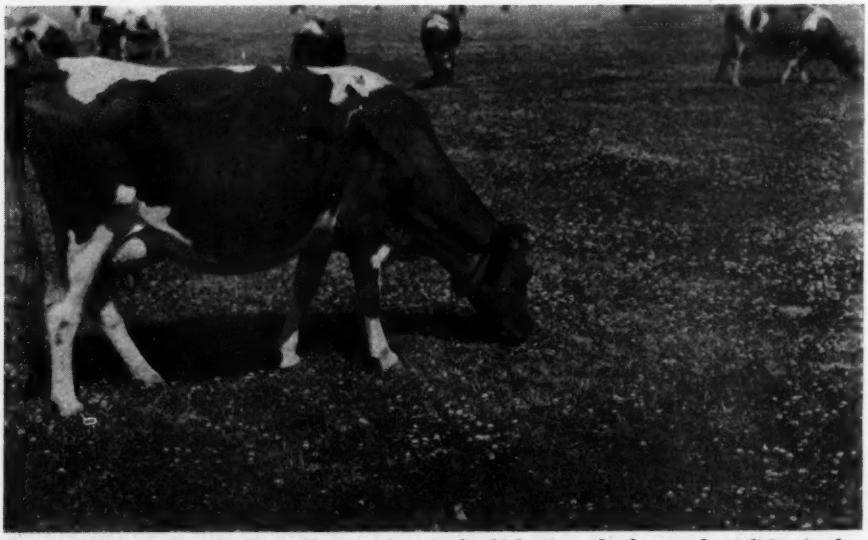


Fig. 5. Tall Grass Retards Clover Growth. Grasses should be in a closely grazed condition in the fall to avoid competition with the clover seedlings.

Insuring Success With Indiana Sweets

By Roscoe Fraser

Agricultural Extension Service, Purdue University, Lafayette, Indiana

THE sweet potato may be grown in almost any part of Indiana. The commercial acreage is located in the southwestern part of the State in the lower Wabash and White River Valleys. In this region between three and four thousand acres are grown with an annual production of more than 500,000 bushels.

Yields vary from less than 100 to 300 bushels per acre depending on fertilization and cultural methods. In a survey taken in the Terre Haute Fruit and Vegetable Growers' Association we found the following results:

> 50% of growers produced sweet potatoes; acreage—range ¼ to 5, average 2.1 acres; yield range, 60 to 300, average 140 bushels; fertilizer, 32% use some fertilizer, 68% use no fertilizer; average amount of fertilizer used, 280 pounds; 92% of growers have some wilt; 89% of growers have some black rot; 20% of growers have some insect injury; no growers use any treatment to prevent wilt and black rot; no growers use certified plants or seeds.

The sandy soils of this area are well adapted to sweet potato production and large yields of high quality potatoes can be obtained, but results from the survey taken in Honey Creek Township, Vigo County, as a cross-section of the industry show that there is a need for use of improved practices throughout the area. A demonstration put on by the Honey Creek 4-H Club, "Success with Indiana Sweets," shows how sweet potatoes can be more profitably grown in southwestern Indiana.

Most northern markets prefer the little or big stem Jersey varieties so these are grown to meet the market demands. A few moist type varieties such as Porto Rico and Nancy Hall are grown in farm gardens for local consumption. Clean, fertile, sandy soils with relatively high amounts of organic matter are preferred as these soils produce a high percentage of smooth, bright, uniform potatoes of superior quality. Heavier soils usually produce an excess of vine growth which retards maturity. While sweet potatoes are tolerant of acid soils, the most profitable yields are produced on fields slightly acid to neutral.

A definite planting rotation should be followed and sweet potatoes should not be grown more than once every four or five years in the rotation in order to help prevent disease infestation. A cover crop of rye planted in the fall and plowed under in the spring will add organic matter to the soil.

Good seed is essential. Many of the troubles experienced by growers are directly traceable to the seed stock used, method of bedding, or both. Only hill-selected seed, carefully picked at digging time and kept in clean containers under good storage conditions, should be used. When growers are forced to purchase seed, either certified stock or those known to be free from disease should be bedded. All seeds should be kept as dormant as possible until bedding.

The hotbed should be started early enough to allow about 30 days for plant growth. Most growers like to plant in the field during the early part of

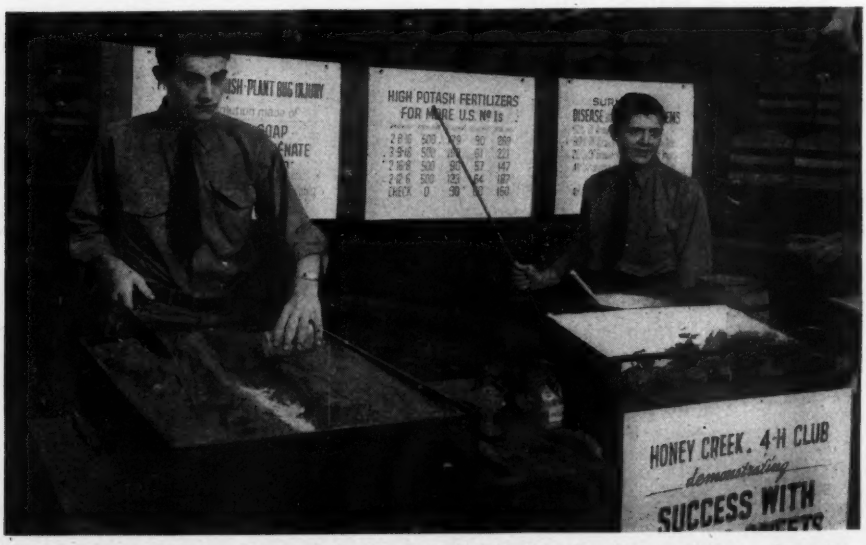
May, therefore, potatoes should be bedded early in April.

The old bed should be thoroughly cleaned and disinfected, sash and all, to help control black rot, wilt, and other diseases. A solution of formaldehyde, made by mixing one pint of formalin and one pint of water, should be used for disinfecting. It is advisable to repeat this treatment after 24 hours. Soil for the hotbed should be obtained from some place where sweet potatoes have never been grown. The upper six inches of the soil should be thrown away and only the subsoil used, as topsoil may be contaminated with sweet potato disease organisms.

Hotbeds may be either electrically or manure heated. The temperature in a manure-heated hotbed will rise to about 100° and five or six days later drop to 75° or 80°. The hotbed is then ready for planting.

Seed stocks saved from the previous crop should be sorted again before bedding. Any diseased or discarded seed should be destroyed and not carried out to the plant bed and scattered around. To kill all disease organisms, all seed stocks before bedding should be treated for 10 minutes in a solution consisting of 1 oz. corrosive sublimate to 8 gallons of water. The seed should be bedded firmly on the sand and spaced about one inch apart. This spacing provides ample room for developing strong, vigorous plants. After placing, the potatoes should be covered with sufficient clean, warm sand and watered thoroughly. Bedding should be done on warm, bright days and the temperature of the sand and water should be as near that of the sweet potatoes or hotbed as possible. Sweet potatoes should not be chilled as they are likely to rot. During the warmer part of the day the temperature may go as high as 90° to 95°, therefore the bed should be closely watched and ventilation given when needed to prevent further rise.

Growers have a tendency to over water, and if watering is necessary, it should be done in the morning on clear days so the foliage may be thoroughly dried before night. During the cool nights or days, added protection such as a sheet of Sisalkraft paper or blankets placed over the hotbed sash may be necessary, but under ordinary conditions a tight-fitting sash will conserve



Wayne Ennen and Herbert Young of the Honey Creek School in Vigo County, Indiana—first-prize, vegetable demonstration team at the Purdue 4-H Club Round-up, June 10, 1942. They won a trip to the Pittsburgh Junior Vegetable Growers National Meeting and Contest to be held in December, 1942. The boys were coached by Vocational Teacher John Turner and Assistant County Agent Howard Emme of Terre Haute, Indiana.

the heat. As the season advances, more ventilation is needed until eventually the sashes are left off entirely so that the plants may be hardened off for field planting.

The soil should be well prepared before setting the plants. The ground should be plowed early, allowed to settle, and worked down until ready to apply the fertilizer and build the ridges.

The chunky type of sweet potato is preferred in most markets. Experimental work carried on elsewhere as well as repeated demonstrations in Indiana thoroughly indicate that fertilizers carrying a high percentage of potash produce the highest yields of the chunky sweets.

Recent yield-plot tests throughout the sweet potato region of southwestern Indiana carried out by the cooperative fertilizer trials show the results given in Table I.

These results indicate that fertilizers carrying two to three per cent nitrogen and potash in the ratio of two to one over phosphoric acid give best results. The past treatment and a soil analysis will determine somewhat the amount and analysis of fertilizer to use. The recommended practice is to apply 400 to 600 pounds of a fertilizer analyzing either 2-8-16 or 3-9-18. The fertilizer is applied in a row under a shallow to medium ridge built a few days before planting. The fertilizer can be applied with a corn planter and ridges made with a single bottom-breaking plow.

When pulling plants, those that show symptoms of disease or discoloration should be culled out and discarded. Another factor affecting yields is the length of the rooted stems. Results from twelve demonstration plots in southwestern Indiana are given in Table II.

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TABLE I—HIGH POTASH FERTILIZERS FOR MORE U. S. No. 1's.

Comparative Yield of Sweet Potatoes with Different Amounts and Analyses of Fertilizers

Cooperator	Analysis	Pounds per acre	Bushels U. S. No. 1	Bushels U. S. No. 2	Total Yield
1	2- 8-16	500	179.5	89.5	269.0
	3- 9-18	500	160.0	61.0	221.0
	2-16- 8	500	90.0	57.0	147.0
	2-12- 6	500	123.5	64.0	187.5
2	2-16- 8	625	191.0	94.0	285.0
	3- 9-18	625	248.5	87.5	336.0
	Check	.....	90.0	60.0	150.0
3	2- 8-16	800	176.7	75.8	252.5
	3- 9-18	800	170.5	63.1	233.6
	2-16- 8	800	151.5	56.8	208.3
	2-12- 6	800	151.5	66.3	217.8

TABLE II—LONGER ROOT STEMS INCREASE YIELDS

Rooted Stem	U. S. No. 1	U. S. No. 2	Total Yield	Percentage U. S. No. 1
1 inch	135.5	54.40	189.90	71.3
2 inch	129.31	56.11	185.42	69.7
3 inch	164.04	68.97	233.01	70.4

Fig. 1. Onions on muckland in western New York. Heavy fertilization, including a high percentage of potash, on this well-decomposed muck produced a yield of 850 bushels of onions per acre.

Managing Mucks Includes Control of Blowing

By A. F. Gustafson

Cornell University, Ithaca, New York

ON THE basis of an inquiry conducted by the author in 1940, there are 25 million acres of organic soils in the United States.[1] Thirty-four states have varying acreages of these valuable soils. Each of 6 states has more than 2 million acres. These states are: Minnesota, 7; Michigan, 4; Louisiana, 3; Wisconsin, 2½; Florida, 2¼; and Washington, 2⅛ million acres. In addition, Alaska has immense acreages and Canada has more than 29 million acres of organic soils.

The muck soils of the United States occur in the glaciated area and on the Atlantic, Pacific, and Gulf coast lines and other poorly drained areas. Nearly 11 per cent of these organic soils are in cultivation, including hay and pasture. Vegetables occupy an important acreage. Among the leading vegetables are onions, potatoes, celery, cabbage, and carrots. Mint occupies large acreages in Michigan and Indiana. Hay crops and pastures also are grown on an important total area.

Relatively heavy expense has been incurred in clearing and draining organic soils. The muck farmer, therefore, has a rather large investment in his land. Gross returns per acre from the more productive mucklands are relatively high. As a result, these lands command a fairly high price. Moreover, many vegetable crops require large amounts of hand labor and a considerable investment in seed and fertilizer. A high grade of management is required, therefore, to produce large crops; and good salesmanship is necessary to dispose of the products advantageously.

[1] Soils and Soil Management, McGraw-Hill Book Co., Inc. 1941, p. 395.

Fig. 2. Wind injury to onions. The onions in the foreground were "blown out." Lettuce has been seeded in the blown-out area.

Muck soils are generally much higher in nitrogen than are mineral, or so-called hard soils. From two to three per cent nitrogen is frequently carried by these organic soils. Their phosphorus content is one to three times that of mineral soils. In potash content, however, muck soils usually are relatively low. Many crops, therefore, require liberal applications of potash for the production of economically high yields. The calcium content and the reaction of these soils are highly variable. The reaction varies from below pH 4 to about pH 8. Liming is required for many crops on the more acid mucks. In contrast, strongly alkaline to neutral and very slightly acid mucks in Michigan receive considerable quantities of sulphur (usually applied for several crop years at one time) or 300 to 400 pounds of manganese sulphate per acre annually, for a wide range of crops. The other trace elements, copper, zinc, and boron, are needed under some conditions. Some areas in New York contain so much zinc that it kills the crop.[2] It seems best to make certain that a deficiency exists before any of the trace elements are applied, except for experimental areas. That deficiencies exist has, of course, been established in some areas.

It has already been stated that for most crops muck soils are deficient in potash. Liberal applications of potash in the fertilizer are required to produce satisfactory yields. Most crops require a normal application of phosphorus. For most vegetables, nitrogen is not used on recently cleared mucks. For vegetables in general, fertilizer is applied in liberal amounts, from a few hundred pounds to 1,200 for onions and up to 2,000 pounds per acre for celery (Fig. 1).

Protecting Investment

The investment in fertilizer, lime, labor, and seed to get a crop started may be lost if adequate provision is not made to protect it against wind damage. Areas of old-cultivated muck that are much more than half a mile across generally may be subject to blowing under conditions that are favorable for it. Smaller areas, especially, if surrounded by trees or higher land, enjoy a measure of protection.

Among the vegetables that suffer from blowing, onions that are grown from seed, in contrast to those grown from sets, are especially vulnerable to injury by wind (Fig. 2). From the time the tiny seedlings emerge until they are large enough to protect themselves, they are very tender. These

[2] Staker, E. V., and Cummings, R. W.: The Influence of Zinc on the Productivity of Certain New York Peat Soils. Proc. Soil Sc. Amer., Vol. 6, 1941.

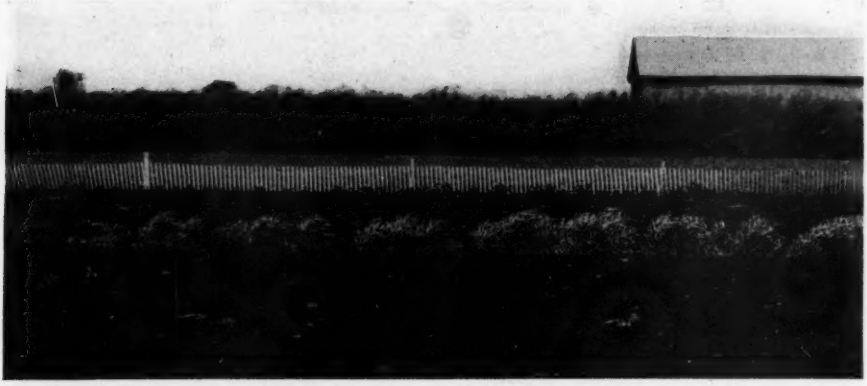

Fig. 3. This basket-willow windbreak has attained its normal height and is in a highly effective condition for checking wind velocity. The picket fence is of the half or 2-foot height. In the immediate foreground is a drill row of oats.

onions are particularly susceptible to injury immediately after coming up. Strong winds pick up bits of wood or sharp-cornered granules of muck and drive them against the plants. Once blowing begins after the onions are up, it is too late to protect them. A few hours of active abrasion are too much; the plants do not recover so as to produce even a fair yield. Another crop must be planted to obtain any return from the land. Other plants are susceptible in varying degrees to wind injury, and total losses from wind injury to crops on our mucklands are enormous. Because we shall have need for all the vegetables we can grow during the duration of this war, control of losses from wind injury is imperative.

What can be done to control the wind? "Surely the wind bloweth where it listeth," you say. Maybe so, but farmers themselves have worked out ways of controlling wind erosion on mucklands. It is only at fairly high velocities that winds possess destructive force. Reducing the velocity of the wind through the use of windbreaks is the major solution of this problem.

Various types of windbreaks are in use. One of the earliest was the willow tree. In time, however, these attained heights of 40 to 60 feet and corresponding width. Although fairly effective in checking the velocity of winds, such windbreaks wasted valuable land. Not only did the tree shade a wide strip, but the roots of the trees robbed the crops

Fig. 4. Snow-fence windbreaks and willow windbreaks at back and on right. Snow fence, however, is depended on over the main part of this large field of onions.

of moisture and plant nutrients. Farmers in western New York have been using the basket willow (Fig. 3) for some years. This willow, which attains a height of 10 to 15 feet, or slightly more, grows readily from slips and affords considerable protection in two or three years. Where the prevailing wind direction during the wind-injury period is southwest, the windbreaks are planted north and south. Wastage of land is controlled by cutting off the sides from time to time.

Farmers do not place dependence on the willow windbreak alone; it is often supplemented by other types. Prominent among these is the woven picket, or snow fence. On some newly cleared beds, this fence is used exclusively (Fig. 4). Snow fences along highways are used to cause drifting of snow, that is, the velocity of the wind is reduced to such extent that the wind drops the snow. In onion beds, however, it is essential to prevent the picking up of granules because drifting is highly undesirable. Not only do farmers wish to hold the soil in place, but the filling of ditches and the covering of roads with drifted muck results in the added expense of clearing them.

The snow fence has many advantages. It may be placed easily and quickly soon after onions or other sensitive crops are planted. It occupies no cropping space permanently. Moreover, the wind shifts somewhat in direction, and windbreaks at right angles to the main ones are needed. The snow fence serves this purpose admirably. When the onions are large enough to check blowing on the surface of the muck or when the blowing season has passed, the fences are easily rolled up and stored away.

In some areas, farmers lease or borrow snow fences from county or state highway authorities. If the highway superintendents do not have authority in all states to lease snow fences to farmers within their areas, such legal power should be granted them. Having such authority is essential during this emergency because of shortage of materials and labor for making snow fences for individual growers.

Fig. 5. Rows of oats help protect onions against blowing injury.

Newly started willow windbreaks during their growth may be supplemented with snow fence or a few rows of rye drilled immediately adjacent to the willows. A drill row or two of oats occasionally are used in the same way. Single drill rows of oats have recently been used between the rows of onions (Fig. 5). Up to 14 rows of onions were noted between the oat rows. Where oats are used, the snow fences

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C. T. Butler Watches Plants and Livestock

By L. O. Brackeen

Agricultural Extension Service, Auburn, Alabama

"PLANTS and livestock talk," says C. T. Butler, Master Farmer of New Hope, Alabama. "If you don't think so just watch them. I have learned by watching plants that my land is deficient in potash and phosphate. I have found that corn, following lespedeza, often needs potash and phosphate, or sometimes a complete fertilizer. By applying a mixture of 300 pounds of phosphate and 100 pounds of muriate of potash (equivalent to 400 pounds of 0-12-12½ fertilizer) I have increased corn production 20 to 25 bushels per acre following lespedeza."

Mr. Butler also fertilizes his permanent pastures. "I find the livestock relish the fertilized grasses more than the unfertilized and consequently make better growth," he says.

That he knows what he is talking about is indicated by the fact that he produces crimson clover for seed and grazing; hairy vetch for turning and seed production; soybeans for hay and seed; lespedeza sericea for hay, seed, and pasture; alfalfa for hay; cowpeas for hay and seed; and annual lespedeza for hay, seed, and semipermanent pasture. He puts up about 125 tons of corn and sorghum silage annually. He uses DPL 11-A cottonseed, Walkers Improved and Indian Chief corn, Hastings 100-bushel oats, and an improved variety of barley.

Native cows are bred to Shorthorn bulls for calf production, and a few mares are kept for producing colts. Mr. Butler keeps about 50 beef cows, 45 hogs, 75 sheep, 12 goats, 100 hens, 10 mules, and 4 horses. The mules are treated for "bots" and teeth are floated, sheep are treated for worms, hogs vaccinated, and cattle given blackleg treatment.

Another fact indicating that Mr. Butler is a most successful farmer is that his family has been named by the Alabama Extension Service and Progressive Farmer-Ruralist as a "Master Farmer Family."

"All nine tenant families on this farm live in improved homes, have washing machines, radios, sanitary toilets, and waste sinks and drains; eight have electricity, most of them have pressure cookers, and two have running water piped from a mountain-side spring," writes Mrs. Maude Alexander, home agent.

"Yes, and do not forget that they all have gardens and truck patches, and hogs, chickens, and cows for producing their home needs of meats, milk, eggs, and vegetables," adds J. B. Mitchell, farm agent. "They not only produce enough of these for home use but some for sale. In addition, each family, including the negro family with about 10 members, cans enough fruits and vegetables to last them through the seasons of the year when fresh fruits and vegetables are not available."

A visit to the Butler home, over the farm, and to some of the tenant homes confirmed, to our satisfaction, that the farm and home agents were correct when they stated that the Butlers and their tenants are doing an excellent job of farming.

"We certainly are proud of our tenants; they are so cooperative," said Mrs. Butler, as we sat upon the porch of the

Log home of Mr. and Mrs. Hugh Baker, tenant family on the Butler farm.

home of Mr. and Mrs. Baker, one of the nine tenant families on the farm. "Yes, and we are proud of you for being so good to us," responded Mr. Baker, who lives in a modern four-room log house which he constructed from logs cut on the farm.

While visiting with the Butlers and Bakers we were impressed with the way they work together for the good of each. We found that Mr. Butler has worked out a system whereby both landlord and tenants have plenty of work to do throughout the year. "We are doing something all the time. If we can't work in the field, we clean seed, bale hay, cut wood, repair houses, and make improvements," said Mr. Butler. "We have found that it pays big dividends to work throughout the year rather than have too many rest seasons," stated Mr. Baker. Landowner and tenant agree that it is best for both families that they have work throughout the year.

Mrs. Butler has found one objection; it is difficult for her to get odd jobs done around the house since Mr. Butler keeps the men folks so busy. She has partly solved this problem by working it out with the children to do some of the lighter work. The Butler boys and the children of the white tenant families work together in doing many of the jobs. When they have finished they are paid in cash, by free picture shows, or with other favors. "They like it," said Mrs. Butler.

Each family has its own crops, but usually work with others in producing and harvesting the crops. If something causes one to get behind with his crop, the others "fly in" and help him work it out.

The tenants work on the half-and-half basis. The landowner furnishes the workstock, farming tools, one-half the fertilizer, and one-half the ginning; the tenants furnish the labor, one-half the fertilizer, and one-half the ginning. When working in the pasture, planting and harvesting small grain, looking after the livestock, or working in Mr. Butler's crops, the tenants are paid daily wages.

Thus it can be said that plants and livestock talk and that real partnership between landlord and tenants pays on the farm of Mr. and Mrs. C. T. Butler and Sons—Charles, Jr., and John Ed—of Madison County, Alabama.

Growing Legumes For Nitrogen

By G. R. Cobb

Salisbury, Maryland

FARMERS faced with a shortage of "commercial" nitrogen are being urged to grow their own by seeding legumes. In far too many cases this is the only advice offered. It is a well-known fact that legumes in themselves have no power to take free nitrogen from the air, and unless the crop is properly handled, it may leave the soil poorer than before the crop was planted.

The benefits to be derived from legumes have been recognized since the world began, apparently, for the Romans knew that beans and vetches were the best preparation for a wheat crop. But it was not until comparatively recently, 1886, that the reasons why legumes benefited wheat and other crops were discovered. The early experiments of Boussingault, Saussure, Lawes and Gilbert and others were conflicting in that in some cases under controlled conditions no nitrogen was added to the soil while they all agreed that crops grown under other conditions contained more nitrogen than was contained in the soil and manure. In 1886, when Hellriegel and Wilfarth discovered that leguminous plants fix atmospheric nitrogen, the answer to the conflicting results was obtained.

From early writings one is impressed with the fact that the value of legumes was well known. In 1819, Frederick Butler advised that upon sowing flax, oats, or barley, you should sow clover as a fertilizing crop and stock down for two years; then, turn in the clover for wheat with one, two, or three ploughings, according to the soil or other cir-

Lespedeza worked into the soil preparatory to seeding a fall grain crop returns plant food to the soil.

When a large crop of alfalfa is baled and sold from the farm, large amounts of plant food also leave the farm.

cumstances. If you use clover as a fertilizing crop, he continued, your lands will rise in value under every rotation and increase your revenue. The death of the clover leaves the land enriched by the decay and putrefaction of the roots. Apparently, others had a similar opinion relative to the value of clover on succeeding crops and as a soil-improver, for an article was written by Joseph Harris for the Genesee Farmer, 1863, in which he stated that in certain circumstances it may be better to plough under the clover instead of feeding it to the livestock on the farm. Ten years later he wrote that we should have to go back to the old-fashioned plan of ploughing under the clover.

Writing on European agriculture Henry Colman in 1846 states, "Of vegetable manures I have only to say that buckwheat and clover are often turned in by the plough and with acknowledged advantage." He added further that clover, which appears twice in the rotation on French farms, is to be considered as the only enriching crop. The French farmers understood very well the advantage of ploughing in a clover stubble, but for lands not very rich it was considered only as an aid and not as a principal manure. Relative to the value of the stubble George E. Waring, writing in 1870, emphasizes the fact that the same results as ploughing under the entire crop, especially in the case of clover, would obtain from the roots alone. These roots when ploughed under and allowed to decompose in the soil constitute an excellent manure, acting both chemically and mechanically. That the value of the roots and stubble is not as high as the entire crop will be discussed and refuted further along in this article.

The discovery by Hellriegel and Wilfarth that legumes were able to take free nitrogen from the air only when certain bacteria were present has been accepted by all research workers and others. To mention but a few of the references—alfalfa, for example, is able to use the nitrogen from the air only when the nitrogen-fixing bacteria are present. These microscopic organisms commonly live in tubercles upon the roots of legume plants, and they have the power to take up free nitrogen and cause it to unite with other elements to form compounds which are utilized by the plant. Still another reference states that "these pod bearers are not them-

selves capable of converting the air nitrogen into food, but the work of making it suitable for them is carried out by micro-organisms known as bacteria which are found living in the wart-like excrescences upon their roots. The fact is well known that without the nitrogen-fixing bacteria, which live symbiotically with the plants, no free nitrogen can be gathered by the crop, thus the presence of these bacteria is necessary or the legume plant fails in its function as a 'nitrogen-raiser.'"

Not only is it true that legumes without the nitrogen-fixing bacteria have no power to take nitrogen from the air, but the fact remains that even when the soil is properly inoculated with the right bacteria, the plants may not gather any of the free nitrogen. Summarizing but a few of the references bearing on this point, clover and other legumes take available nitrogen from the soil in preference to the fixation of free nitrogen from the air; the latter is being drawn upon only to supplement the soil's supply and thus balance the plant-food ration. Again we read that with an abundance of available soil nitrogen constantly provided to fully balance the other essential elements or factors, there is little or no development of root tubercles and little or no fixation of free nitrogen. In his First Principles of Soil Fertility, Vivian states that it may be further said that so long as the leguminous plants procure in the form of nitrates all of the nitrogen they need, the nodules will not be formed. For that reason in a soil rich in nitrogen the root tubercles may not be found on the legumes even when the proper bacteria are present. Thus when grown on rich soils, legumes leave the soil poorer in nitrogen; but on poorer soils furnishing less than the normal amount of available nitrogen, the growing of legumes will enrich the soil in proportion to its poverty. As Dr. Cyril G. Hopkins expresses it, "To the soil that hath not shall be given, but from the soil that hath shall be taken away."

It has been claimed by Albrecht that legumes are nitrogen-fixers rather than soil-nitrogen consumers only when they are generously supplied with calcium and the other essential bases.

Reference was made to the fact that some believe that the roots and stubble alone will give as good results as the entire crop turned under, but proof is lacking. However, there is ample proof that if the crop be harvested and only the roots and stubble turned under, the soil may show a decrease rather than an increase in nitrogen. Even at its best the roots and stubble of a clover crop contain no more nitrogen than was taken from the soil, whereas, for each crop turned under in its entirety, there is added to the soil from 25 to 56 pounds of nitrogen.

Legumes are classed very often as "soil-improvers" when, as a matter of fact, if handled incorrectly, they are "soil-depleters" as evidenced by the following references: C. B. Williams states that the only constituent legumes can add to the soil when plowed in, other than what they took from the soil, is nitrogen. The crop when cut and removed from the land will not ordinarily add any more nitrogen to the soil than it removed from it. This being the case, legumes grown on land and removed for hay or for any other purpose can hardly be classed as soil-improving crops since under such a system the nitrogen supply of the soil will just about be maintained. However, there will be a loss of from 8 to 16 pounds of phosphoric acid and from 26 to 54 pounds of potassium from the available supplies of the soil for each ton of legume hay removed. From Scarseth we learn that for each bushel of soybeans there is removed from the soil 0.75 pound of phosphoric acid and 1.0 pound of potash, while Schuster states that if crops of soybeans are cut for hay, it will take 700 pounds of 7-6-14 fertilizer to replace the plant food removed. In other words, a crop of about three tons of soybean hay will remove 50 pounds of nitrogen, 40 pounds of phosphoric acid, and 100 pounds of potash which can be replaced by an application of

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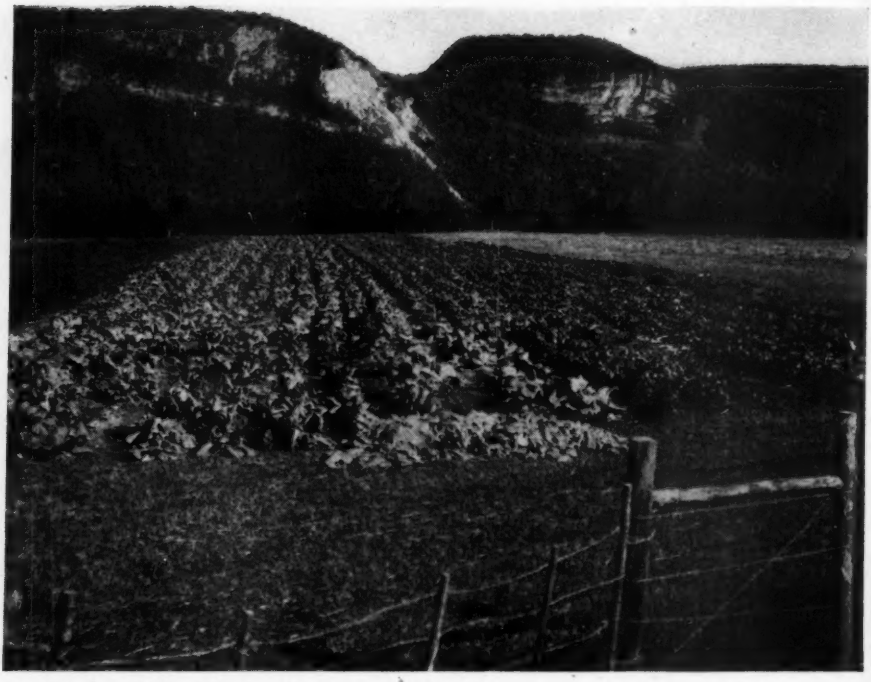
PICTORIAL

A FARM BOY'S ROUTINE INCLUDES REGULAR AFTER-SCHOOL CHORES.

THE PRESSURE OF HARVEST WORK

EMPLOYS MANY HANDS AND DEVICES.



One is apt to think of Newfoundland as ice-bound, but here is proof of what can be done in the short growing season. Above, a good stand of vegetables; below, celery, well-fertilized with a 4-8-28 fertilizer.

The Editors Talk

Rebuilding The Old

The despair of the past yields to hope for the future when one views at close range the rebuilding of old, worn-out farms now taking place under the guidance of the Soil Conservation Service, as was our happy experience during a recent three-day field trip with the officials of that Agency through the Piedmont section of South Carolina and Georgia. Here the rolling hills and abundant rainfall, with open winters, have provided ideal conditions for soil erosion to bring about its tragic worst, washing away the topsoil, the Nation's most vital asset, and driving the farmers to steadily decreasing economic levels and finally off the land entirely. The result has been abandoned farms, left to nature to do her will at further devastation or rehabilitation as suited her whims, and abandoned farmers, eroded with labor and bankrupt, drifting to urban centers, leaving behind their agricultural skills, and taking with them only their desperate need for a livelihood. The bare red hills and deep gullies of these formerly and still potentially productive farm lands and the economic and human tragedies which they represent have long been a familiar sight to the traveler through those regions—sympathetic perhaps, appalled frequently, but impotent until the organization of the Soil Conservation Service in response to the Nation's demand that something be done about it.

Now, something *is* being done about it, and what is being done inspires and justifies the hope and confident expectancy that the land is going to be saved. It is *being* saved. Starting with the worst farms—not the best where the job would be the easiest—and by definition with the farmers frequently carrying mortgages—not the more prosperous with money in the bank—the farm is "planned" in terms of grades of soils, contours, waterways, wood supplies, etc. Then terraces are laid out or redesigned to deliver their water into natural waterways which are planted to soil-holding perennials, legumes such as lespedeza sericea and kudzu, depending on the slope—no longer onto the highways to wash them away! Contour strip farming, row-crops rotated with legumes, are substituted for the formerly exclusive cotton and corn; steeper slopes and gullies are covered with kudzu and other denuded areas with sericea; natural meadows and favorable slopes are set aside as permanent pastures; wood-lots are planted or cleared in terms of farm requirements; and the inevitable barren strips by woodlots are planted to sericea as wild-life protection areas. These for the most part are measures which the individual farmer adopts for himself once the plan is supplied him.

What are the results—now abundantly obvious to the casual observer—for to provide contrast there are many, too many "control" farms, farms where this system has not yet been adopted? Observations are supplemented by the enthusiastic owner whose willing testimony leaves no room for doubt as to the great and increasing improvement in his economic status after the relatively short period of three to five years. Of most importance, erosion is placed under such

control that the run-off is *water,* not soil. The rotations with legumes give markedly increased yields of the cash crops, both per acre and per farm, even with reduced acreage planted to the cash crop. The sericea yields both hay and abundant seed. The kudzu yields hay and even when planted over gullies provides excellent grazing—and a red clay gully providing grazing for livestock is something to shout about! With increased yields of provender, livestock herds are being built up, the wise policy of first providing feed before getting the animals being followed. But above all is the over-all economic return—the farmer and his family kept on the land, his cash income increasing from year to year, his labor rewarded, his courage restored.

The enthusiasm and zeal of the men of the Soil Conservation Service are easily understood when one sees the results of their guidance. They are impressed but not appalled by the enormity of their task in trying to undo the ravages of nature uncontrolled for over 100 years under the one-crop system. While their personnel and funds are minute as compared to the number of farms in need of their help, they see their ideas spreading rapidly from farm to farm; for while farmer conservativeness is proverbial and the daily bread is his major concern, the farmers of the southern Piedmont are of the old stock that made America what it is. They have not lost their native intelligence nor faculty for observation and imitation nor spirit of determination.

They are worth keeping on the land!

Topsoil

"Topsoil would be guarded like the family jewels if farmers realized how much it is worth in crop production," says Lindley G. Cook, extension soil conservationist, Rutgers University, in commenting on tests held this year to determine what effect the depth of topsoil has on crop yields.

Potatoes were used as the crop for study, and tests were carried out on various Monmouth and Middlesex County farms by the New Jersey Agricultural Experiment Station and Research Division of the Soil Conservation Service, Cook reports. Yield comparisons were made between eroded and uneroded areas in the same field rather than between different farms or different fields.

In discussing results of the tests, Cook related that "potato yields were 8.6 per cent greater where topsoil is three to six inches in thickness than where the surface soil is less than three inches deep. And there was an increase of 9.4 per cent in yield where the surface soil is more than six inches deep as compared to a depth of three to six inches."

"By comparing 32 separately measured areas on four different farms, it was indicated that potato yields were 34 per cent greater where the topsoil is more than six inches in depth as compared to areas on the same farms where there is less than three inches of topsoil," he says. "The fact that potato yields are a full third higher where topsoil has not been washed or blown away shows that proper care of our topsoil is one of the best means of keeping up production for the war effort and after the war as well."

Erratum: In the article "The Southeast Can Grow Clover and Alfalfa" which appeared in the August-September issue of this magazine, the sentence at the top of page 16 should have read "Borax applied at the rate of 15 pounds per acre on Cecil sandy loam in Virginia. . . ." instead of "Borax applied at the rate of 15 pounds per acre on Cecil sandy loam in North Carolina. . . ."

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizer

¶ A summary and analysis of some of the investigations being conducted on the growing of alfalfa in New Hampshire are reported by Ford S. Prince, Paul T. Blood, Gordon T. Percival, and Paul N. Scripture in New Hampshire Experiment Station Circular 58, "Fertilizer Needs of Alfalfa on New Hampshire Soil." This work was conducted on two farms over a period of several years. Potash appeared to be the first limiting factor since greatest increases in yield were obtained from this when the single fertilizer nutrients were applied. Best results were obtained, however, when potash and superphosphate were used together. When manure was not applied, nitrogen in the fertilizer also was beneficial. The use of lime was highly beneficial up to correcting soil acidity, but when additional lime was used, there was no additional benefit. The omission of potash from a complete fertilizer applied to alfalfa not only reduced yield but also caused the alfalfa to die out sooner and the stand was replaced with grass. This occurred even though manure had been applied. It is pointed out that if large amounts of manure are used, nitrogen in the fertilizer can be reduced, but large applications of potash and phosphoric acid will be needed if yields are to be maintained at a high level. A comparison of applying large amounts of fertilizer at planting time with smaller annual applications, so that in both cases the same total amount of plant food was applied, showed that over a two-year period best results are obtained with a large application at planting time. The authors feel that results on this point are not conclusive since the work was not conducted over a sufficient length of time to permit drawing any more than tentative conclusions.

¶ Investigations to determine the cause and remedy for browning, which was causing much trouble to cauliflower growers in New York State, showed that this difficulty was due to boron deficiency. This work is described by C. H. Dearborn in Cornell University Agricultural Experiment Station Bulletin 778 entitled "Boron Nutrition of Cauliflower in Relation to Browning." After preliminary work had shown that the difficulty was due to boron deficiency, detailed experiments and investigations were conducted. The external appearance of the head and leaves and the internal appearance of the head when boron is deficient are carefully described and illustrated. In greenhouse experiments, borax applied at rates from 5 to 25 pounds to the acre increased the yield over the no-borax treatment. All of the borax treatments increased the weight of the head about equally. It was found that the borax treatments also greatly increased the root growth of the cauliflower plant. While the fresh weight of the head was increased by borax treatments, the percentage dry matter in the head was higher in the plants that were deficient in boron, showing that carbohydrates apparently were being transferred to the head. Dry matter in the entire parts of the plant above ground was about the same with or without boron treatments, although the fresh weight of the boron-treated plant was 14.5%

higher than those not treated with boron. The heads of the boron-treated plants, while lower in percentage dry weight, were higher in actual weight of dry matter owing to the heads being larger than the plant not treated with boron.

A study of the tissues of normal and boron-deficient plants showed that boron deficiency produced a formation of gummy material between the cells in the pith. This material later became brown and seemed to be lignin-like in nature. This gumming started near the center of the stem and spread toward the outside. As the stem elongated, the pith was pulled apart along the line of this gummy material, resulting in cracking which frequently is seen on stems of boron-deficient cauliflower. At the time the gum developed, the cells greatly enlarged. Much the same thing happened in the tissues of the head, and also many cells in the actively growing sections died. The browning and gumming between the cells of the vascular or conducting tissue were very general except in the older tissues of the stem. The browning gradually filled in the spaces in the tissue, but the author believes that the number of bundles that were plugged in any section was too small to account for the death of the surrounding tissue because of inadequate transportation of materials. Symptoms of boron deficiency in the root were much the same as in the other parts of the plant, but a test for reducing sugars showed their presence in large amounts, indicating that there was transference of the sugar; in fact, there were greater than normal amounts of reducing sugars in the boron-deficient plants. The gumming undoubtedly interfered with normal transference of materials but certainly did not appear to prevent such transference.

"Soil and Crop Interrelations of Various Nitrogenous Fertilizers," Agr. Exp. Sta., New Haven, Conn., Bul. 458, May 1942, M. F. Morgan and H. G. M. Jacobson.

"Fertilizer Recommendations for Fall Seeded Grain Crops in 1942," Dept. of Agron., Mimeo. 33, Purdue University Agr. Exp. Sta., Purdue, Indiana.

"Field Tests of the Relative Effectiveness of Different Phosphate Fertilizers," Agr. Exp. Sta., Lexington, Ky., Bul. 420, Jan. 1942, George Roberts, J. F. Freeman, and Harold Miller.

"Fertilizer Needs of Alfalfa on New Hampshire Soils," Agr. Exp. Sta., Durham, N. H., Cir. 58, April 1942, Ford S. Prince, Paul T. Blood, Gordon P. Percival, and Paul N. Scripture.

"Fertility Needs of Dairy Farm Crops in the Connecticut Valley," Agr. Exp. Sta., Durham, N. H., Cir. 61, April 1942, Ford S. Prince, Paul T. Blood, and Gordon P. Percival.

"Inspection of Commercial Fertilizers for 1941," Agr. Exp. Sta., Durham, N. H., Bul. 336, Nov. 1941, T. O. Smith and H. A. Davis.

"Boron Nutrition of Cauliflower in Relation to Browning," Agr. Exp. Sta., Ithaca, N. Y., Bul. 778, April 1942, C. H. Dearborn.

"Wartime Fertilizers For Wheat and Other Fall-Sown Grain," Agr. Ext. Serv., Columbus, Ohio, 1942.

"The Application of Commercial Nitrogenous Fertilizers to Berks Silt Loam Soil is Profitable," Va. Polytechnic Institute, Blacksburg, Va., Bul. 337, March 1942, P. T. Gish.

"Fall Fertilizer Recommendations," Agr. Exp. Sta., Morgantown, W. Va., MWS-9, August 1942.

"Cooperative Manufacture and Distribution of Fertilizer by Small Regional Dry-Mix Plants," U. S. D. A., Washington, D. C., Cir. C-126, June 1941, John H. Lister.

Soils

¶ While it has been known that the mineral composition of crops will vary with the conditions under which they are grown, data as to the extent of these differences with the various crops growing at several levels of fertility in the field were generally lacking. Investigations conducted at Purdue University furnish interesting and significant information on the subject. These are reported by R. E. Lucas, G. D. Scarseth, and D. H. Sieling in Purdue University Agricultural Experiment Station Bulletin 468, "Soil Fertility Level As It Influences Plant Nutrient Composition and Consumption." Corn, soybeans, wheat, mixed hay, lespedeza, and oats growing on three different soils with several different fertilizer treatments were analyzed. Not all crops were grown on all soils nor were the fertilizer treatments the same in all cases. The grain and the straw or stover were

analyzed separately, and the timothy, alsike, and red clovers making up the mixed hay also were analyzed separately.

It is impossible in this short review to give more than a few highlights of some of the great mass of data presented. In most cases, analyses were made for nitrogen, phosphorus, potassium, magnesium, and calcium, and frequently total and available nutrients in the soils on which the crops were grown were determined. Considerable variation in the mineral contents of the crops due to different fertilizer treatments and to different fertility levels of the various soils was found. It is pointed out that corn is a heavy user of plant nutrients; and if high yields are to be obtained, large amounts of nutrients, in a proper balance, must be made available to the crop. Both of these factors must be given consideration since a well-balanced nutrient at a low level will give satisfactory corn but low yield, and only if large amounts of properly balanced nutrients are present, can high yields of good quality crops be obtained. In general, the composition of the grain did not vary nearly as much as the composition of the stalks, this same relationship holding true for all crops which were analyzed separately for the seed part and the stalk.

The soybean analyses show that this crop makes even heavier demands on the nutrients of the soil than corn. The crop appears to have very good foraging powers which accounts for its ability to get along satisfactorily on soils of moderate or low fertility. The crop following the soybeans, however, will feel the effects of the foraging efficiency of soybeans, and thus other crops in the rotation suffer unless adequate provision is made to replace the nutrients removed by the soybeans.

In the hay analyses, an inter-relationship of the nutrients, which could be observed in all cases, was particularly marked. The nitrogen content of the hay was influenced by the fertility of the soil, the better soils having a higher nitrogen and consequently a higher protein content. When lime was used, the yields were increased, but the amount of potash being used was not sufficient under these conditions to permit the complete utilization of the phosphate applied. The authors state that when no lime is used the ratio of nutrients applied, which in this case was 2 parts of phosphoric acid to 1 part of potash, appeared to be satisfactory; but on liming, the increased crops produced made heavier demands on the potash in the soil with the result that the supply was soon exhausted and the crop produced was lower than normal in this nutrient. The following crops, of course, would suffer even more unless provision was made to increase potash supply in the soil. The timothy was a very efficient forager for potash, as indicated by the high content of this nutrient even when it was not applied. The crop following timothy, however, would feel the effects of this and suffer from a lack of available potash unless provision was made to replace the potash removed by the timothy.

In considering the results on the various soils, it appears from the data on analyses and yields that the full potentialities of the most fertile soil could not be realized unless more potash was used than had been the case in the experiments in question.

Data are presented on the apparent contribution by the soil from its reserve supply of nutrients. It is brought out that even depleted soils furnish certain amounts of nutrients. The net gain or loss in nutrients will depend, of course, on the amounts of nutrients applied, as compared to the amounts removed by the crop. Without any treatment, there was a net loss of both phosphate and potash. When fertilizer in a 2-1 PK ratio was used, either alone or with lime and manure, there was a net gain in phosphate but an increased net loss in the potash. The treatment stimulated yields to the extent that the crops removed much more potash than was added in the fertilizer, but the net loss in all treated cases usually was about the same regardless of variation

in yield. The authors conclude from this that plant root density does not influence very much the amount of potash a plant can remove from the soil, and that the available potash supply of the soil depends mainly on weathering processes, aside from amounts supplied as fertilizer. The authors believe that when very small amounts of fertilizers are used, they should be high in phosphorus and low in potash, but as the application of fertilizer increases, the proportion of potash in the fertilizer should be increased.

Throughout the work there was an apparent tendency for calcium and magnesium to have a reciprocal relationship to potash content. Calculation shows a rather constant value for the sums of the three bases.

The authors compared their analyses with those reported by Morrison in his book, "Feeds and Feeding." They found that in general the nitrogen content of the non-legume was very similar in both cases, although the nitrogen content of legumes was found to be higher in the Purdue work. The phosphorus content usually was about the same in both cases. The potash content of the crop in the Purdue investigations usually was much lower than the values given by Morrison. It is assumed that his data were obtained some years ago when the fertility of the soils was higher, and consequently the crops had a higher potash content. The differences are taken to indicate the depletion in available potash content of soils in Indiana.

In summing up the work, the authors state that the hay crops are heavy feeders on potash. Corn and soybeans are heavy feeders on all three nutrients while the small grains are heavy consumers of phosphate. The authors believe the importance of magnesium in plant nutrition has not been given sufficient importance. On the Crosby soil, the common 2-1 PK ratio does not supply sufficient potash. When manure and residues are returned to the soil, a 1-1 ratio should be used; when they are not returned, 1-1.5 or 1-2 ratio would appear to be needed if high yields are to be obtained. On the Bedford soil, manure was particularly beneficial in increasing the potash content of crops, but the authors point out this would not be the case where potash was more limiting than it is on this soil. It is stated that the data show that about 70 per cent of the added phosphorus is recovered by crops in a four-year rotation on a limed soil, but only about 50 per cent of the phosphorus is recovered on unlimed soil.

¶ Practical information on the why and how of using lime has been prepared by the Extension Service in South Carolina and issued as Circular 218 of the Clemson Agricultural College Extension Service, "For Land's Sake Use Lime." The liberal use of charts and illustrations clearly shows farmers what benefits can be obtained from the proper use of lime. Information on when to apply lime, how to apply it, the amount to use under different conditions of soil and cropping, and its use in connection with the AAA program are covered. It is brought out that lime is not a cure-all and will not replace other good farming practices such as proper crop rotation and use of fertilizer. Similar information for Iowa farmers is given in Iowa Agricultural Extension Bulletin P45, Liming Iowa Soils, by B. J. Firkins.

"Studies on Plant Food Availability in Alkaline-Calcareous Soils: Seedling Tests and Soil Analysis," Agr. Exp. Sta., Tucson, Ariz., Tech. Bul. 94, Aug. 15, 1942, W. T. McGeorge.

"Effect of Drought and Rainfall on Movement of Soil Nitrogen in Cecil Soils," Agr. Exp. Sta., Experiment, Ga., Cir. 137, July 1942, E. D. Matthews.

"Illinois Loess—Variations in its Properties and Distribution: a Pedologic Interpretation," Agr. Exp. Sta., Urbana, Ill., Bul. 490, July 1942, Guy D. Smith.

"Soil Fertility Level As It Influences Plant Nutrient Composition and Consumption," Agr. Exp. Sta., Lafayette, Indiana, Bul. 468, April 1942, Robert E. Lucas, George D. Scarseth, and Dale H. Sieling.

"Liming Iowa Soils," Agr. Exp. Sta., Ames, Iowa, Bul. P45 (New Series), May 1942, B. J. Firkins.

"Soil Survey of Iowa, Decatur County," Agr. Exp. Sta., Ames, Iowa, Soil Survey Report 80, May 1941, Roy W. Simonson.

"Soil Survey of Iowa Marion County," Agr. Exp. Sta., Ames, Iowa, Soil Survey Report 81, Nov. 1941, Roy W. Simonson and T. H. Benton.

"Soil Survey of Iowa Ida County," Agr. Exp. Sta., Ames, Iowa, Soil Survey Report 82, April 1942, Roy W. Simonson and T. H. Benton.

"Contour Strip Cropping," Agr. Ext. Serv., St. Paul, Minn., Ext. Folder 108, June 1942, M. A. Thorfinnson.

"Soils of Golden Valley County," Agr. Exp. Sta., Bozeman, Mont., Bul. 403, April 1942, L. F. Gieseker.

"Effect of Irrigation Waters and Cropping on the Nutrients and Exchangeable Bases of Desert Soils," Agr. Exp. Sta., State College, N. M., Tech. Bul. 292, May 1942, C. W. Botkin and E. C. Smith

"Soil and Field-Crop Management for Northwestern New York," Agr. Exp. Sta., Ithaca, N. Y., Bul. 777, March 1942, A. F. Gustafson.

"Studies Concerning the Supply of Available Potassium in Certain New York Orchard Soils," Agr. Exp. Sta., Ithaca, N. Y., Memoir 241, Dec. 1941, Walter Reuther.

"Defend Your Nation and Its Soil," Agr. Ext. Serv., Raleigh, N. C., Ext. Bull. 2 (War Series), May 1942, Earl Meacham.

"Are You Growing Gullies or Trees?" Agr. Ext. Serv., Raleigh, N. C., Ext. Cir. 255, June 1942.

"Percolation and Water Requirement Studies with Alfalfa by Means of Lysimeters in Oregon," Agr. Exp. Sta., Corvallis, Ore., Bul. 404, Feb. 1942, S. H. Hastings and H. K. Dean.

"For Land's Sake Use Lime," Agr. Ext. Serv., Clemson, S. C., Cir. 218, July 1942.

"A Survey of Tobacco Soils in Wisconsin," Agr. Exp. Sta., Madison, Wis., Res. Bul. 142, Jan. 1942, James Johnson and W. B. Ogden.

"Tree Shelterbelts or Windbreaks Helpful on the Northern Great Plains," U. S. D. A., Washington, D. C., C.S.C. Folder 12.

"Protection and Care of Farm Woods," U. S. D. A., Washington, D. C., C.S.C. Folder 13.

"Tree Planting to Stabilize Gullies and Stream Banks," U. S. D. A., Washington, D. C., C.S.C. Folder 14.

Crops

¶ In recent years considerable interest has developed in Ladino white clover, particularly in the Mid-Atlantic and New England States. It has been found to have great possibilities as a producer of large quantities of high-quality forage. It can be used successfully as a hay, silage, pasture, or cover crop, although it is not suitable in a lawn. In order to furnish information on this comparatively new crop, E. A. Hollowell has prepared U. S. Department of Agriculture Farmers' Bulletin No. 1910, "Ladino White Clover for the Northeastern States." He brings out that a high-producing crop such as Ladino clover makes very heavy demands on the mineral food supply of the soil. Lime usually will be needed to supply calcium and correct soil acidity. Phosphate fertilizers are usually needed, and potash also since most soils in this section are deficient in this nutrient. The best fertilizer to use will vary with soil, but as a general recommendation the author suggests 400 to 600 pounds of superphosphate per acre and if there is a potash deficiency, 200 pounds of muriate of potash per acre, or other fertilizers equivalent to these. Sometimes small amounts of nitrogen are needed in establishing a stand, although when it gets going, this legume, of course, fixes its nitrogen from the air. The bulletin also gives general cultural directions and makes suggestions on the utilization of the crop.

¶ A series of interesting and important investigations on tobacco in Canada is reported by G. M. Ward in Canadian Department of Agriculture Publication 729 entitled "Physiological Studies with the Tobacco Plant." Five distinct, but to some extent related, phases of the work are reported in a way to make up five sections in the bulletin. The first investigation dealt with effects of potassium on cigar tobacco. This involved detailed analyses of two crops of tobacco given three different rates of potash fertilization, the other nutrients being held constant, together with yield data and grade index over a five-year period. The three rates of potash application were 27, 100, and 200 pounds of K_2O per acre. Increasing the rate of application increased the yield only moderately, but increased the grade index used to measure quality much more markedly and much more consistently. The data on chemical analysis showed that increasing potash caused a corresponding increase in the content of this nutrient in the leaves. The calcium and magnesium in the leaves were de-

creased when the potash was increased, although the calcium-magnesium ratio was not affected by potash fertilization. There was a slight tendency for the phosphorus to decrease with increased potash applications, although the variations were small. The sulphur and chlorine contents of the plant tended to increase as the potash was increased. In the case of sulphur this is not surprising since the potash was applied in the sulphate form except for that which was in the cottonseed-meal. The sulphur does not increase to nearly the same extent as does the potash content of the leaves with the increased application. There was a tendency for the nicotine and nitrogen to decrease as the potash increased. When light and dark colored leaves were analyzed, it was found that potash, phosphorus, and chlorine did not vary consistently, while the lighter leaves had a higher percentage of calcium, magnesium, and slightly higher sulphur than the dark leaves, the latter being higher in nicotine and nitrogen. The leaves in the upper part of the plant tended to be higher in phosphorus, sulphur, nitrogen, and nicotine, while the lower leaves in the plant were higher in calcium, magnesium, and potassium. Analyses of the soil for total and replaceable potash were made and it was found that with increasing potash applications, the replaceable and even the total potash were increased, and this was correlated with improved quality of the tobacco crop growing on the soil. Burn tests confirmed previous findings that any treated potash content of tobacco caused an increased fire-holding capacity.

The second article was a similar study but related to the effects of phosphorus on cigar tobacco. The P_2O_5 application varied from 40 pounds to 320 pounds per acre in four increments. Increasing the phosphorus application tended to increase yield, although the biggest increase usually occurred between the 40- and 80-pound treatments. The grade index of the tobacco was improved with increasing phosphorus applications up to 160 pounds P_2O_5 per acre, above which there usually was a falling off in grade index. Increasing the phosphorus fertilizer increased slightly but consistently the phosphorus content of the leaves. The calcium and sulphur also were increased since these were added in larger amounts when increased amounts of superphosphate were applied. The treatment also tended to increase the chlorine content of the leaves, while the potash and the nitrogen tended to decrease. The light colored leaves in this work tended to be higher in calcium, magnesium, potassium, sodium, and chlorine; they were lower in phosphorus, nicotine, and total nitrogen, while sulphur and manganese did not show any significant differences. Increasing the phosphorus content of the leaves had a deleterious effect on the burning quality.

The third section of the bulletin dealt with the course of mineral absorption by tobacco during its growth period. In this work cigar leaf, burley, and flue-cured tobacco were studied. Curves are given showing absorption of calcium, potassium, magnesium, phosphorus, sulphur, chlorine, iron, manganese, and nitrogen during the growing season. The data are then figured to a pound-per-acre basis. The figures among the types of tobacco and for the different years vary considerably. As general averages, however, it was found that around 125 pounds of calcium oxide were removed by cigar tobacco, around 70 pounds by the flue-cured tobacco, and 164 pounds for the burley tobacco. Magnesium oxide was removed to the extent of about 20 pounds by cigar tobacco, around 12 pounds for flue-cured tobacco, and almost 30 pounds for burley tobacco. The P_2O_5 varied greatly but averaged around 25 pounds for cigar tobacco, 15 pounds for flue-cured tobacco, and 16 pounds for burley. The K_2O removed by cigar tobacco was around 230 pounds, by flue-cured tobacco 50 pounds, and by burley tobacco 53 pounds. The acre yield for the cigar tobacco was around 1,900 pounds, for flue-cured tobacco 1,000 pounds, and for the burley 1,100 pounds.

The fourth section of the bulletin dealt with carbohydrates in flue-cured tobacco. It was found that soluble sugars were directly related to the quality of the cured leaves, the highest sugar content giving a better quality leaf. During the curing process soluble sugars tended to increase and insoluble sugars to decrease. This work was conducted on flue-cured tobacco. The final article is a carbohydrate study on cigar tobacco. It was found that carbohydrates are not nearly so important in determining the quality of cigar tobacco as they are of flue-cured tobacco. This appears to be due to the fact that during fermentation the carbohydrates in the cigar tobacco leaves largely disappear. Detailed analytical data on all of the papers are given in the appendix of the bulletin.

"4-H Club Manual in Corn Production," Agr. Ext. Serv., Little Rock, Ark., Ext. Cir. 124, March 1942, Charles F. Simmons.

"Soybeans for Oil," Agr. Ext. Serv., Little Rock, Ark., Leaflet 23.

"Peanut Production in Arkansas," Agr. Ext. Serv., Little Rock, Ark., Leaflet 24.

"Grow a Victory Garden," Agr. Ext. Serv., Little Rock, Ark., Leaflet 27.

"Grow Sorghum for Syrup," Agr. Ext. Serv., Little Rock, Ark., Leaflet 31, 1942.

"Legume Seed Harvest Will Beat the Nitrogen Shortage and Save You Dollars," Agr. Ext. Serv., Little Rock, Ark., Leaflet 33.

"The San Joaquin Experimental Range," Agr. Exp. Sta., Berkeley, Calif., Bul. 663, April 1942, C. B. Hutchison and E. I. Kotok.

"Handling and Shipping Tests with New Potatoes From Kern County, California," Agr. Exp. Sta., Berkeley, Calif., Bul. 664, April 1942, W. R. Barger, G. B. Ramsey, R. I. Perry, and John H. MacGillivray.

"Irrigation Experiments with Pears and Apples," Agr. Exp. Sta., Berkeley, Calif., Bul. 667, May 1942, A. H. Hendrickson and F. J. Veihmeyer.

"Physiological Studies with the Tobacco Plant," D. C. D. A., Ottawa, Canada, Publ. 729, Tech. Bull. 37, February 1942, G. M. Ward.

"Alfalfa for Hay, Silage, and Pasture," D. C. D. A., Ottawa, Canada, Publ. 735, Farmers' Bul. 110, May 1942, J. M. Armstrong, F. S. Nowosad, and P. O. Ripley.

"Annual Report for the Year Ending October 31, 1941," Agr. Exp. Sta., New Haven, Conn., Bul. 452, April 1942.

"Causes, Effects and Control of Defoliation on Tomatoes," Agr. Exp. Sta., New Haven, Conn., Bul. 456, March 1942, James G. Horsfall and John W. Heuberger.

"Yankee Hybrid Summer Squash An Early Productive First Generation Cross," Agr. Exp. Sta., New Haven, Conn., Cir. 152, May 1942, Lawrence C. Curtis.

"1941 Annual Report Delaware Agricultural Extension Service," Agr. Ext. Serv., Newark, Del., Ext. Bul. 36, May 1942.

"Fifty-Third Annual Report for the Fiscal Year Ending June 30, 1941," Agr. Exp. Sta., Gainesville, Florida, A.R. 1941.

"1941 Report Florida Agricultural Extension Service," Agr. Ext. Serv., Gainesville, Fla., A-1941.

"Avocado Production in Florida," Agr. Ext. Serv., Gainesville, Fla., Bul. 112, April 1942, H. S. Wolfe, L. R. Toy, and A. L. Stahl; Revised by H. S. Wolfe.

"Papaya Culture in Florida," Agr. Ext. Serv., Gainesville, Fla., Bul. 113, June 1942, H. S. Wolfe and S. J. Lynch.

"High Lights in Agricultural Research in Idaho," Agr. Exp. Sta., Moscow, Idaho, Bul. 244, A.R. 1941.

"The Idared Apple," Agr. Exp. Sta., Moscow, Idaho, Cir. 84, April 1942, Leif Verner.

"Yield of Sweet Corn in Relation to Distance and Rate of Planting," Agr. Exp. Sta., Urbana, Ill., Bul. 487, May 1942, W. A. Huelsen.

"Tomato Growing—Ten Points for the Home Gardener," Agr. Ext. Serv., Urbana, Ill., Ve-1, Jan. 1942, Lee A. Somers.

"Soybean Varieties and Culture," Agr. Ext. Serv., Lafayette, Ind., Leaflet, May 1942.

"Strawberry Production in Southeastern Iowa as Influenced by Varieties, Fertilizers, and Cultural Practices," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 295, March 1942, Philip Minges, T. J. Maney, and B. S. Pickett.

"Grass Farming for Improving Depleted Soils," Agr. Exp. Sta., Lexington, Ky., Cir. 52, March 1942, S. J. Lowry and L. M. Caldwell.

"How to Plant Shade Trees," Agr. Ext. Serv., Lexington, Ky., Ext. Cir. 371, October 1941, N. R. Elliott.

"The Vegetable Garden Month by Month," Agr. Ext. Serv., Lexington, Ky., Ext. Cir. 376, Feb. 1942, John S. Gardner.

"Blooming Dates of Some Selected Hardy Perennials," Agr. Exp. Sta., Amherst, Mass., Bul. 392, April 1942, Harold S. Tiffany.

"Bay State, a Red Forcing Tomato Bred for Resistance to Leaf Mold," Agr. Exp. Sta., Amherst, Mass., Bul. 393, June 1942, E. F. Guba.

"The Composition and Nutritive Value of Potatoes with Special Emphasis on Vitamin C," Agr. Exp. Sta., Amherst, Mass., Bul. 390, March 1942, William B. Esselen, Jr., Mary E. Lyons, and Carl R. Fellers.

"Hay Crop Silage," Agr. Exp. Sta., St. Paul, Minn., Bul. 360, May 1942, N. N. Allen and J. B. Fitch.

"Influence of Flowering and Fruiting Upon Vegetative Growth and Tuber Yield in the Potato," Agr. Exp. Sta., St. Paul, Minn., Tech. Bul. 150, June 1942, W. L. Bartholdi.

"America Needs More Milk," Agr. Ext. Serv., St. Paul, Minn., Pamph, 94, Feb. 1942.

"Corn and Oats," Agr. Exp. Sta., State College, Miss., Bul. 368, June 1942, H. O. West.

"A Vegetable and Field Crop Seed Treatment Outline for Mississippi," Agr. Exp. Sta., State College, Miss., Cir. 105, May 1942, J. A. Pinckard.

"Handling Peach Trees After Winter Killing of Fruit Buds," Agr. Exp. Sta., Columbia, Missouri, Cir. 221, March 1942, T. J. Talbert.

"Home Flower Gardens," Agr. Exp. Sta., Columbia, Missouri, Cir. 223, March 1942, J. E. Smith.

"A Cytogenetic Study of Zea and Euchlaena," Agr. Exp. Sta., Columbia, Missouri, Res. Bul. 341, March 1942, Joseph G. O'Mara.

"Defend Our Soil with Grass," Agr. Ext. Serv., Lincoln, Neb., CC 47, 1942.

"Soybean Production in Nebraska," Agr. Exp. Sta., Lincoln, Neb., Bul. 339, April 1942, T. A. Kiesselbach and W. E. Lyness.

"The Relations of Vegetative Composition and Cattle Grazing on Nebraska Range Land," Agr. Exp. Sta., Lincoln, Neb., Res. Bul. 123, March 1942, T. E. Brinegar and F. D. Keim.

"Alfalfa Breeding," Agr. Exp. Sta., Lincoln, Neb., Res. Bul. 124, June 1942, H. M. Tysdal, T. A. Kiesselbach, and H. L. Westover.

"Bronco Grass (Bromus tectorum) on Nevada Ranges," Agr. Exp. Sta., Reno, Nevada, Bul. 159, April 1942, C. E. Fleming, M. A. Shipley, and M. R. Miller.

"Mobilize New Hampshire Forage Resources," Agr. Ext. Serv., Durham, N. H., Ext. Cir. 242, May 1942, J. L. Haddock, M. F. Abell, and L. A. Johnson.

"Pruning Grapevines," Agr. Exp. Sta., New Brunswick, N. J., Cir. 423, April 1942, H. J. Sofick and J. Harold Clark.

"Silage Without Molasses," Agr. Exp. Sta., New Brunswick, N. J., Cir. 439, April 1942, Carl B. Bender and Howard B. Sprague.

"Reseeding Practices for New Mexico Ranges," Agr. Exp. Sta., State College, N. M., Bul. 291, April 1942, J. O. Bridges.

"The Blueberry in New York," Agr. Exp. Sta., Geneva, N. Y., Cir. 189, Rev. 1942, G. L. Slate and R. C. Collison.

"The Control of Wind Erosion on Muck Lands," Agr. Ext. Serv., Ithaca, N. Y., Bul. 482, March 1942, A. F. Gustafson.

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"Herbaceous Perennials," Agr. Exp. Sta., Raleigh, N. C., Bul. 333, June 1942, G. O. Randall and J. G. Weaver.

"A Comparison of Legume Hays for Milk Production," Agr. Exp. Sta., Wooster, Ohio, Bul. 631, July 1942, C. C. Hayden.

"The Uneven Ripening of Concord Grapes: Chemical and Physiological Studies," Agr. Exp. Sta., Stillwater, Okla., Tech. Bul. T-13, June, 1942, James E. Webster and Frank B. Cross.

"A Study of Problems Relating to Production of Fall-Crop Irish Potatoes in Oklahoma," Agr. Exp. Sta., Stillwater, Okla., Bul. B-258, June 1942, H. B. Cordner.

"Feeding for Milk Production," Agr. Exp. Sta., Corvallis, Ore., Bul. 398, Oct. 1941, I. R. Jones and R. W. Morse.

"Farm Research in South Dakota," Agr. Exp. Sta., Brookings, S. D., 54th A. R., June 30, 1941.

"Fifty-Third Annual Report 1940," Agr. Exp. Sta., Knoxville, Tenn., A.R. 53, 1940.

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Economics

¶ With publication of "Economic Study of Land Utilization in Sussex County, Delaware," R. O. Bausman has completed a detailed study of land utilization in the entire state of Delaware, similar studies for the other two counties in the State having been published previously. The publication on Sussex County is issued as Bulletin 233 of the Delaware Agricultural Experiment Station. Trends in the number and size of farms, in livestock number, and in acreages of various important crops are given. Dairying appears to be on the increase and milk sold has risen sharply since 1920, with butter production falling off during the same period. The number of swine and sheep in the county has decreased markedly. Chickens increased up to 1930 and fell off during the last 10 years. Acreages in wheat have fallen off sharply and corn, moderately. Alfalfa acreage increased up to 1930 but has fallen off considerably during the last 10 years. The acreage of annual legume hays, however, has increased and is holding its high position. Apple trees have fallen off in number and peaches, after having fallen sharply from 1900 to 1920, have remained at a low level. The acreage of vegetables has gone steadily upward.

About half the county is put in the lowest type of land, and very appropriately there are comparatively small acreages of crops grown on this land. Yields of crops are correlated with soil series and also with the general quality of land. As is to be expected, the efficiency of the farming usually was better on the good land than on the poor land. The author also gives considerable attention to the social aspect of land utilization.

¶ A survey and analysis of farm management practices in Central Maine have been made by Emil Rauchenstein and Andrew E. Watson. Their results are published in Maine Agricultural Experiment Station Bulletin 408 entitled "Farm Management on Central Maine Farms with Dairy Enterprises." The miscellaneous dairy farms had the highest labor income while the specialized dairy farms had the lowest, although there were some farms in this group with labor income of over $1,000. In general, those farms which diversified their enterprises so as to have income from crops as well as from the dairy were the most profitable. The supplementary sources of income were potatoes, sweet corn, canning peas, wood, and poultry. While fertilizers were commonly applied to cash crops on the farm, pastures and hay crops were largely neglected. Only 1.5% of the hay land and .4% of the pasture area were fertilized. The authors bring out the fact that farmers could well afford to try lime, phosphate, and potash on their hay and pasture land, especially in view of the assistance in meeting the cost of these treatments they can obtain under the Agricultural Conservation Program. Judging from work conducted in the State, the use of lime and fertilizer would increase the production of forage, and, what is more important, increase it during the summer when added feed is needed to help increase milk production during the time of year when it usually falls off. It is stated that applications of lime, phosphate, and potash usually stimulate White Dutch clover, and when this is present in the turf, it helps to make better summer and fall pastures.

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"Organization and Efficiency of Dry-Land Wheat Farms in Eastern Idaho," Agr. Exp. Sta., Moscow, Idaho, Bul. 243, April 1942, Leo J. Fenske and Paul A. Eke.

"Effects of Crop Acreage Control Features of AAA on Feed Production in 11 Midwest States," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 298, April 1942, T. W. Schultz and O. H. Brownlee.

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"Prices of Farm Products in Iowa, 1851-1940," Agr. Exp. Sta., Ames, Iowa, Res. Bul. 303, May 1942, Norman V. Strand.

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Farm Soils

(*A Book Review*)

PROFESSOR Edmund L. Worthen of Cornell University has revised his well-known book on soils (Farm Soils, Their Management and Fertilization, by Edmund L. Worthen, John Wiley and Sons, Inc., New York, N. Y., Third Edition, 1941. $2.75.) The book is written primarily with the student of vocational agriculture in mind. The field covered is broad and remarkably complete for a high school course in soils and fertilizers. This fact makes the volume a good reference book for the student after he leaves the school and for farmers and their advisers.

The book is divided into twelve chapters, titled respectively: Selecting the Soil and Planning its Management; Growing the Crop; Controlling the Water Supply of the Soil; Tilling the Soil; Manuring; Liming; Fertilizing; Leguming and Green Manuring; Managing Field Soils; Managing Pasture Soils; Managing Garden, Greenhouse, and Lawn Soils; and Managing Fruit Soils. Each chapter is systematically arranged into general introductory remarks, operations, and general information, with suggestions for community studies, practice problems, and references at the end of the chapter. The sections of the chapter are further broken down into appropriate sub-sections.

The author has made every effort to present his subject matter from a practical viewpoint. Technical material has been kept to the minimum necessary to an understanding of the principles governing the application of the practices under consideration. It usually is given in the general information section of the chapter and is explained in a manner that should make it clear to anyone with a general education of high

school standards. The author's many years' experience in extension work has given him an intimate knowledge of farmers' problems, providing an excellent background in preparing a book for use by those who are farming, or will farm in the near future. For those who have not had a course in chemistry, a section presenting the essential information needed to understand the necessary chemical phases of soils and fertilizers is included.

While Professor Worthen covers agriculture in all parts of the country, emphasis is placed on the agriculture of the Northeast, and the corn and wheat belts of the Midwest. He appears to have been rather conservative in presenting some of the newer ideas on fertilizer placement, and on soil and tissue testing as a guide to fertilizer needs. Considerable exception might be taken by some of the fertilizer suggestions of the author, but he repeatedly tells the reader to consult his local authorities for the latest information on fertilizer recommendations for any particular locality. An unusual number of cross references are given in the book, a procedure which is of great help and value in getting together information on a subject, all phases of which cannot well be considered in one place in a book.

Much attention is given to the proper use of manure, green manure, and cover crops, especially legumes. The fundamental importance of these in a system of soil management to maintain and build up the fertility of the soil fully warrants the repeated references to them. They are particularly timely in view of the present shortage of chemical nitrogenous fertilizers and the necessity of obtaining from the air as much nitrogen as practicable by the growing of leguminous crops.

Managing Mucks Includes Control of Blowing

(*From page* 17)

may be placed farther apart. The oats must be removed as soon as the danger of blowing is passed. Otherwise, a row of onions on each side will be delayed in growth and the yield reduced accordingly. Rye can be used, but it would have to be planned for and seeded the previous autumn.

Cedars and other evergreens have been used but, because of slow growth, these trees are less desirable than basket willow. The cottonwood has been used to a limited extent. It may be held down by cutting, but the cottonwood appears subject to the same objections as the tree type of willow.

Burlap has been used on snow or other fence. Because it essentially stops the wind, the burlap may cause drifting or the wind may cut out the muck under the fence. It is better in some areas to omit the burlap and place the snow fences closer together. Moreover, burlap is unlikely to be available during the war.

Newly cleared mucks usually undergo little blowing for a few years. With continuing breakdown of the coarser material and decomposition of the muck, blowing becomes more prevalent. After onions and other crops a winter cover of rye, wheat, oats or barley may be sown in time for a good fall growth. Such cover will protect the muck against blowing during any periods in winter when the muck is dry or bare and frozen. If time will permit spring growth before plowing, rye or wheat should be used because ordinary oats and barley are winter-killed. Even so, they would protect the soil against winter blowing. Winter oats or barley should be useful in the sections where

they survive the winter. Any of these grains seeded thickly will supply the soil with valuable active organic matter and will take up and hold soluble plant nutrients against loss, and after plowing the roots will tend to hold the surface of the muck against blowing. From most standpoints, a fall grain that goes through the winter into the spring in a live condition is preferable to spring grains.

Wet soils do not blow, but wet soils are cold in the spring. The water-table, therefore, should not be too high. The windbreak method of control is probably preferable to using a high water-table. Heavy rolling of a well-drained soil before seeding may be helpful.

Conclusion

Windbreaks may be composed of trees, shrubs, grain, or slat or snow fences. Their primary purpose is to check the air movement to such extent that the wind cannot pick up and drive sharp muck granules or pieces of wood against tender crop plants with force. The windbreak plants grown should be adapted to the climatic and soil conditions of the area in which they are used, and the fences should be inexpensive and so built as not to require much labor for setting up, removing, and storing away. Onions and other vegetables on mucklands that are exposed to strong spring winds require protection at critical periods.

Growing Legumes For Nitrogen

(*From page* 22)

1,000 pounds of a 5-4-10 fertilizer. It is stated by Roberts that it will not take many crops of clover to so deplete the available mineral matter in the soil as to reduce production seriously unless some is added.

It is difficult to determine just how much nitrogen a legume gathers from the air and how much from the soil under ideal conditions. One authority assumes that two-thirds comes from the air, whereas, the Wisconsin Station estimates that only 14 per cent of the nitrogen contained in well-infected soybean plants is secured from the air. Another experimenter states that the amount of plant food which wheat under present systems of tillage secures from clover roots and stubble left in the soil has usually been exaggerated. It is probably true that the roots of clover contain about one-third of the nitrogen contained in the entire plant, but in the case of soybeans and cowpeas the amount of nitrogen in the roots is about one-tenth of the total amount in the plant.

When a crop such as clover, vetch, or cowpeas is turned under, the increase in the following crops may or may not be great enough to pay for the hay lost, according to the 1938 Yearbook of the U. S. Department of Agriculture. However, it should be taken into consideration that the green manure may have a marked effect on yields of subsequent crops for two or more years. This residual effect may be due in part to the improved mechanical condition of the soil and the gradual release of nitrogen as decay of the organic matter progresses, but other factors not yet understood are no doubt involved. Earlier writers agree with this opinion, that the beneficial action of clovers is due quite as much to their action on the physical condition of the soil as to the amount of available plant food which they bring to the land.

Based on the above discussion it is evident that legumes themselves are not nitrogen-raisers, and under some conditions they may decrease the nitrogen in the soil and leave it poorer than when the crop was planted. In any case if the crop is cut for hay or grazed, there is no gain in nitrogen but the amount is about maintained. On rich

soil the plants draw their nitrogen from the soil, thus depleting the soil of a large amount of this important element. Legumes not only may draw upon the nitrogen in the soil, but they are heavy feeders upon the minerals such as phosphorus and potassium. Bacteria will not thrive on soils of an acid nature, thus intimating that on acid soils lime should be applied.

It might be better on soils rich in nitrogen to seed a non-legume crop that will furnish more tonnage of green matter than legumes. Such a crop is field corn which contains, in a green state, 6 pounds of nitrogen, 2½ pounds of phosphoric acid, and 9 pounds of potash per ton. Two crops of corn can be secured from a field yearly. Yields of from 25 to 40 tons of green corn per acre are not uncommon. Domestic rye grass is another crop that can well be seeded on rich soil as due to its habit of growth it develops a large amount of roots and penetrates the soil to a considerable depth.

The following suggestions are offered as to the handling of clover or a perennial legume crop when seeded as a soil-improving crop: Turn under the entire crop or cut it early and let lie on the ground when a second crop will grow up through the first one, thus adding more weight of green matter to turn under; inoculate the seed so as to insure the presence of the proper bacteria; apply mineral fertilizer such as an 0-14-14 or similar analysis (under some conditions at seeding time it might be well to apply a small amount of nitrogen in addition to the minerals); if cut for hay and fed to livestock, be sure that the manure is properly handled and that it is returned to the land.

NUTRIENT CONTENT OF SOME LEGUME CROPS

Crop	Yield	Part of Crop	N lb.	P_2O_5 lb.	K_2O lb.	Total
Alfalfa	3 tons	All	140	35	135	310
Sweet Clover	5 tons	All	185	45	165	395
Red Clover	2 tons	All	80	20	70	170
Cow Peas	2 tons	All	125	25	90	240
Soy Beans	2 tons	All	100	30	60	190
Lespedeza	3 tons	All	130	30	70	230

NOTE: Legumes can obtain the greater part of their nitrogen from the air, but a large part of the lime, phosphorus, and potash required may need to be supplied in commercial fertilizer.

Clover Pastures for the Coastal Plains

(*From page* 10)

1941, these two clover pastures were refertilized with 300 pounds of 0-16-8 fertilizer but were not reseeded. Beef production this season is much higher than during the first year.

The vigorous clover growth of these pastures is shown in Figure 6.

The remaining two carpet-grass pastures were fertilized with 400 pounds per acre of an 8-8-5 fertilizer in the spring of 1941. These two carpet-grass pastures, without clover, produced an average of 118 pounds of beef per acre in 1941.

The high gains of steers grazing on the clover-carpet grass pasture may be attributed primarily to the quantity of feed produced (Fig. 7) and to the high calcium, phosphorus, protein, and vitamin content of clover as compared to carpet grass. The relative chemical composition of carpet grass and white clover shows that clovers are approximately three to four times as high in

Fig. 6. Steers Make Excellent Gains on Clover Pasture. This pasture produced 330 pounds of beef the first year it was established. The clovers were seeded on an established carpet-grass pasture without disturbing the sod. The soil was fertilized and the seed was heavily inoculated and re-inoculated.

calcium, and one and one-half to three times as high in phosphorus, potassium, and protein. It is known that the chemical composition of plants is affected greatly by fertilization and growth stage. These relationships of chemical constituents of clover and carpet grass are given on the basis of fertilized plants harvested in a vegetative growth stage.

The good cattle gains on a clover-carpet grass pasture may also be attributed to the effect of clovers on the nitrogen content of the associated grasses. Table 2. The average protein content of carpet grass in the absence of clover during August was as low as 7.23% as compared to 9.89% protein in the presence of clover. Carpet grass is generally higher in protein in the spring, thus the increased protein content of carpet grass growing in association with clover is especially significant.

The grasses growing in association with clovers were stimulated greatly due to the nitrogen supplied to the soil by the clovers. Although clovers made most of their growth during the period of February to June, the effect of clover on stimulated grass growth was still evident in September and October. The

TABLE 2.—LIME AND FERTILIZER PRODUCE GOOD CLOVER GROWTH AND INCREASE THE PROTEIN CONTENT OF CARPET GRASS*

FERTILIZER TREATMENT		Per cent Protein in Carpet Grass**	Clover Growth
1937	1939		
No Fertilizer	.....	7.23	Very poor
600 lbs. 0–16–8	½ initial	8.19	Poor
1 ton lime and 600 lbs. 0–16–8	½ initial	9.48	Very good
1 ton lime and 600 lbs. 0–16–8	¼ initial	9.89	Very good

* Clover grew primarily during the period of February to May, 1940; Carpet grass was plucked for analysis on August 6, 1940.

** The mean differences are highly significant according to the "F" test.

grass grown in association with clovers also maintained a much greener color than the grass grown in the absence of clovers. The fact that clover greatly improves the nitrogen content of the soil and the increased growth of carpet grass is shown in Figure 7.

In conclusion, the need of legumes for improving pastures should be emphasized. To grow pasture legumes fertilization, inoculation, seedbed preparation, date of seeding and fertilizing, management, and planting of adapted varieties are factors that must be carefully considered.

Pastures should receive as much consideration as field crops. Properly managed pastures are profitable pastures.

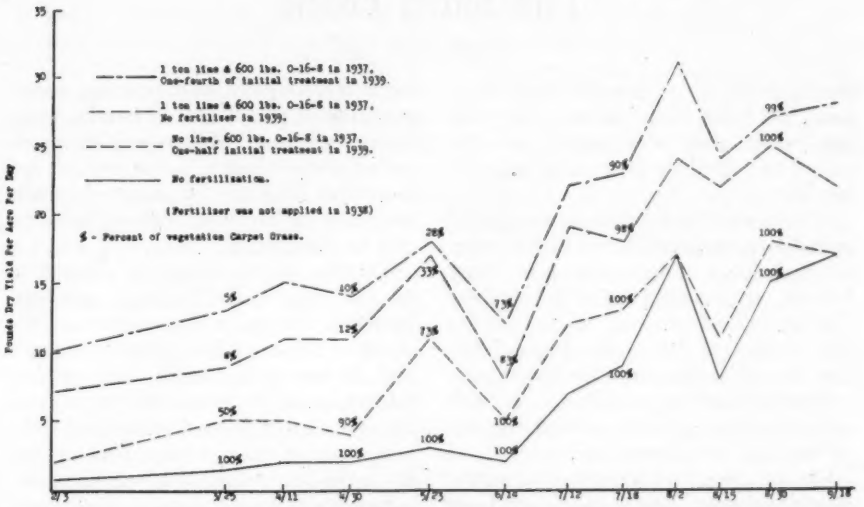

Fig. 7. Seasonal Growth Curves of a White Clover Carpet Grass Sward and Percentage of Carpet Grass When Variously Fertilized. Lime and fertilizer produced excellent clover growth and the yields were increased greatly by refertilization. Clovers stimulated the carpet grass growth greatly. First clippings were made on March 25 and growth curves were computed beginning with February 3.

Insuring Success With Indiana Sweets

(*From page* 13)

According to these yields one- and two-inch rooted stems showed very little difference while the longer rooted stems gave an increase of about 25 per cent over the short rooted stems.

The least time lost between pulling the plants and setting them in the soil means less setback and greater livability after the plants are in the field. When plants have to be transported to distant fields, their roots should be puddled in mud and water to protect them from drying out.

Of late years some troublesome insects have caused considerable damage to the newly planted crop by eating the foliage. Control in the field is expensive and unless an insecticide is properly applied to both sides of the leaf, it is of doubtful value. In order to control stem rot the practice of dipping the roots up to the first leaf in a solution of Spergon is recommended. This solution is made by combining 1½ oz. of Spergon with 1½ gallons of water. This treatment is effective, as proved by the Kansas Experiment Station.

When setting the plants, care should be taken not to set them too deep or too shallow. The use of a sharp stick or "puncher" will make planting much easier when planting by hand, or the plants may be set with a plant-setter where large acreages are grown.

In conclusion, we believe, if growers will pay more attention to these points, they will have more success with Indiana Sweets.

1. Grow sweets in clean, sandy, fertile soils.
2. Guard against wilt and black rot.
3. Grow Yellow Jersey Varieties.
4. Use plenty of potash for chunky sweets.
5. Follow a careful insect control program.

Much of the material for this demonstration is based upon Purdue University Extension Bulletin No. 204, "Sweet Potato Production."

The Farm Front

(*From page* 5)

the local boards will make final decisions, but what is the nature of the official orders they will receive on the question of drafting the remaining rural youth?

It's also true that contractors engaged in military projects like to hire competent farm boys, and this winter in many defense areas older men as well as youngsters will respond to the urgent call, reinforced by wages beyond the ken of any besides bonanza farming.

Another problem which will be more evident as time goes on is transportation —"hauling" as farmers call it.

Go out along any country road in the most productive farm sections and hunt for horses. Yes, there are a few, but mostly old ones. Possibly in the cattle country we might save the less valuable bull calves from the bologna market and turn them into patient oxen. The absurdity of such nonsense may later seem different, if this holocaust keeps on five or ten years. Even the deep South with its sturdy and dependable mule crop cannot escape the transportation dilemma.

If you take a census of the farm trucks, the light ones used for produce, the result will show two-thirds of them ten years old or older. Repair parts for those relics are hard enough to get in normal times. And you can't run on rims, either.

Agricultural truckers are already trying to curtail cross-hauling and needless competitive routing, and farmers are going to assemble stock for central pick-ups. It's not so tough a proposition perhaps with livestock hauling as it is with the more frequent and pressing transportation of perishables like milk, vegetables, and fruit. Milk especially stands out as a sore thumb in the outlook for successful delivery of dairy products from cow to consumer during the next two or three years.

There's just one crumb of comfort to us on this milk hauling problem. Measures are under way to cut out the farms of those slackers who never have and seldom will produce the quality wanted at the country receiving station. But it's a grim and grisly kind of retribution, awful close to home for comfort. Even Grade A milk may beg for a ride before it's over.

Transportation to get the throngs of defense workers to their jobs and home again is matched in the country zones by the threat of irregular deliveries to market of the nation's victuals and vitamins. In neither case do price ceilings play a fundamental part toward a true solution. Union wage scales on one hand and parity levels on the other also fail to answer the transportation bogy.

Given three years more, a major share of the present farm equipment inventory will be costly to maintain in working shape and often risky to operate as well. Add this up beside the hauling obstacles and you begin to wonder if Leon Henderson has the last word after all with his spiral theory.

Farmers hate and fear inflation too but frustration faces them first. They doubt their ability to keep up modern production volume and variety if they are obliged by stern circumstances to

gear themselves to the moss-grown horse n' buggy days. This worries them more than parity prices.

It strikes me that when we holler at each other now about price relationships and advantages and disadvantages, it only gives aid and comfort to spies and enemies. The right track to follow is to direct energy toward helping solve the labor and transportation problems, so that whatever we can produce will be delivered without vexatious bottlenecks.

We've never raised crops during a war under such threats of a stall. Back in the last world war farmers used horsepower more than motorpower, and before it was over, they released some soldiers to come home at harvest time. Industrial wages at that time presented no such competition for the farm.

If folks won't accept farmers' word for what they are doing, then maybe it will be easier to show them what farmers aren't doing.

They are not neglecting the progressive technical side of their profession. The demonstrations and field tests as well as the more useful recommendations made by agricultural extension specialists are still taking deep root.

Unlike some other vocations, the farmer puts a vast amount of pride and enjoyment into producing food. Bumper crops which are not taken out without serious drain on the basic soil fertility remain to the farmer a joyous reward in themselves. To achieve skill in any task or to learn better and quicker ways of accomplishing age-old duties is yet a source of immense, quiet satisfaction to agricultural stewards.

Farmers are not becoming wild-eyed and radical, chasing after some false fetish or listening to agitators.

On the contrary they are minding their own business, being far more perplexed over routine inside the fences than outside. In my State the main assemblies since the war started have centered around getting data on means and methods of greater production, where local committeemen of the war boards were the leaders.

But the best way to drive farmers back into the arms of agitators is to give them the fishy eye of distrust and the malicious slings of criticism for being profiteers. Right now, when so much unfair mouthing is heard in this line, there are lurking organizers trying to capitalize on discontent and frustration so as to gather the farmers into their political pressure group.

Farmers are becoming more than ever a stay-at-home people. With labor extra scarce and work multiplied, plus the rubber famine, our farmers are bound to rely on their communities for more social and spiritual vigor without seeking it in larger and wider fields.

This simply means that unless city folks go out and meet them and talk over problems of the country heart-to-heart with them, a situation will be created that magnifies mistrust.

True, there are vocal leaders in high places and in centers of legislation who presume to represent the farmers and vouch for their opinions on sundry things. But my rule has been seldom to be satisfied that a certain attitude attributed to farmers was the right slant until I followed some grassy lane to interview some old rural friend.

His answers are always carefully weighed and given without heat or rancor, patiently and calmly, as customary with a man who is able to nurse a new-born lamb or kill a chicken hawk with the same casual eye for right and wrong.

Those who really get to know our rural people cannot sit idly by and hear anyone discredit them or ask them to bear the brunt of national adjustments. This is probably why I wrote this theme at this particular time.

But I expect it's mostly wasted, like the preacher talking to crowds of saints while the sinners are absent. My traditional readers are not the ones who have cast the rocks at the ruralites. Yet let's shake hands all around on it because of similar sentiments and do our durndest to correct wrong impressions that foment class prejudice. If we all do it, the tide may turn.

The boys in Australia sent us this one. A mother Kangaroo had patiently scratched her stomach three times, but when the process was to be renewed a fourth time, she snatched two baby Kangaroos from her pouch, spanked them, and said: "How many times have I told you not to eat crackers in bed!"

He: "I never knew love was like this."

She: "Neither did I. I thought there were more chocolates and flowers to it."

Toastmaster (introducing the speaker): "I'm sure that Mr. Jones of the Soils and Fertilizer Department, will give you a pleasant half-hour. He is just full of his subject."

A young lady, with a touch of hay fever, took with her to a dinner party two handkerchiefs, one of which she stuck in her bosom. At dinner she began rummaging to right and left in her bosom for the fresh handkerchief. Engrossed in her search, she suddenly realized that conversation had ceased and people were watching her, fascinated.

In confusion, she murmured, "I know I had two when I came."

A bachelor is a man who never Mrs. anything.

CATASTROPHE

Lone chick, taking a look around the electric incubator full of unhatched eggs: "Well, it looks like I'll be an only child. Mother's blown a fuse."

Sufferer: "I wish I had some drops to cure this toothache."

Friend: "It's all a matter of the mind, not medicine. Yesterday I was feeling terrible. But when I went home my wife put her arms around me and kissed me, and consoled me, so that I soon felt better."

Sufferer: "You don't say. Is your wife at home, now?"

A young candidate for the navy was being put through a general knowledge test by a board of admirals.

"What kind of animals eat grass?" one of them asked.

The candidate fidgeted and stared out of the window, but said nothing. The question was repeated but he still remained dumb.

"Surely," said one of the examiners, kindly, "you can answer a simple question like that? I will repeat it. What kind of animals eat grass?"

"Animals!" gasped the boy, "I thought you said 'admirals'."

And then there was the cow which after jumping the barbed wire fence said, "I'm udderly ruined."

AVAILABLE LITERATURE

The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Potash Pays on Grain (South)
Greater Profits from Cotton
Tomatoes (General)
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Grow More Corn (South)
Fertilizing Small Fruits (Pacific Coast)
Potash Hungry Fruit Trees (Pacific Coast)
Fertilize Potatoes for Quality and Profits (Pacific Coast)
Better Corn (Midwest) and (Northeast)
The Cow and Her Pasture (Northeast) and (Canada)
Fertilize Pastures for Better Livestock (Pacific Coast)
What You Sow This Fall (Canada)
Home-grown Grains for Profitable Hogs (Canada)
What About Clover? (Canada)
Of Course I'm Interested (Pastures, Canada)

Reprints

B-8 Commercial Fertilizers in Grape Growing
T-8 A Balanced Fertilizer for Bright Tobacco
CC-8 How I Control Black-spot
II-8 Balanced Fertilizers Make Fine Oranges
MM-8 How to Fertilize Cotton in Georgia
A-9 Shallow Soil Orchards Respond to Potash
N-9 Problems of Feeding Cigarleaf Tobacco
T-9 Fertilizing Potatoes in New England
CC-9 Minor Element Fertilization of Horticultural Crops
KK-9 Florida Studies Celery Plant-food Needs
MM-9 Fertilizing Tomatoes in Virginia
PP-9 After Peanuts, Cotton Needs Potash
UU-9 Oregon Beets and Celery Need Boron
A-2-40 Balanced Fertilization For Apple Orchards
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
H-3-40 Fertilizing Tobacco for More Profit
J-4-40 Potash Helps Cotton Resist Wilt, Rust, and Drought
0-5-40 Legumes Are Making A Grassland Possible
Q-5-40 Potash Deficiency in New England
S-5-40 What Is the Matter with Your Soil?
T-6-40 3 in 1 Fertilization for Orchards
AA-8-40 Celery—Boston Style
CC-10-40 Building Better Soils
EE-11-40 Research in Potash Since Liebig
GG-11-40 Raw Materials For the Apple Crop
II-12-40 Podsols and Potash
JJ-12-40 Fertilizer in Relation to Diseases in Roses
A-1-41 Better Pastures in North Alabama
B-1-41 Our Defense Against Soil Fertility Losses
C-1-41 Further Shifts in Grassland Farming?
E-2-41 Use Boron and Potash for Better Alfalfa
I-3-41 Soil and Plant-tissue Tests as Aids in Determining Fertilizer Needs
K-4-41 The Nutrition of Muck Crops
L-4-41 The Champlain Valley Improves Its Apples
Q-6-41 Plant's Contents Show Its Nutrient Needs
R-6-41 A Balanced Diet for Nursery Stock
S-6-41 Boron—A Minor Plant Nutrient of Major Importance
U-8-41 The Effect of Borax on Spinach and Sugar Beets
W-8-41 Cotton and Corn Response to Potash
Y-9-41 Ladino Clover Makes Good Poultry Pasture
Z-9-41 Grassland Farming in New England
BB-11-41 Why Soybeans Should Be Fertilized
CC-11-41 There's Enough Potash for National Defense
DD-11-41 J. T. Brown Rebuilt a Worn-out Farm
EE-11-41 Cane Fruit Responds to High Potash
GG-12-41 Borax Helps Prevent Alfalfa Yellows in Tennessee
HH-12-41 Some Newer Ideas on Orchard Fertility
II-12-41 Plant Symptoms Show Need for Potash
JJ-12-41 Potash Demonstrations on Statewide Basis
A-1-42 Canadian Muck Lands Can Grow Vegetables
B-1-42 Growing Ladino Clover in the Northeast
C-1-42 Higher Analysis Fertilizers As Related to the Victory Program
D-2-42 Boron Deficiency on Long Island
E-2-42 Fertilizing for More and Better Vegetables
F-2-42 Prune Trees Need Plenty of Potash
G-3-42 More Legumes for Ontario Mean More Cheese for Britain
H-3-42 Legumes Are Essential to Sound Agriculture
I-3-42 High-grade Fertilizers Are More Profitable
J-4-42 Boron Stopped Fruit Cracking
L-4-42 Permanent Hay the Plant Food Way
M-4-42 Nutrient Availability—An Analysis
N-5-42 Soil Bank Investments Will Pay Dividends
O-5-42 Nutritional Information from Plant Tissue Tests
P-5-42 Purpose and Function of Soil Tests
Q-5-42 Potash Extends the Life of Clover Stands
R-5-42 Legumes Will Furnish Needed Nitrogen
S-6-42 A Comparison of Boron Deficiency Symptoms and Potash Leafhopper Injury on Alfalfa

THE AMERICAN POTASH INSTITUTE

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Need for—

BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

The work of the State Agricultural Stations and recommendations of the County Agents are steadily increasing the recognition of the need for Boron in agriculture. We are prepared to render every practical assistance.

Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

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CONSERVE THE NATION'S SEED SUPPLY

WITH

Spergon

★ ★ ★ ★ ★ ★

In 13 Significant Pea Seed Treatment Tests the Average Stand for Untreated Seed was 52%—Seed Treated with Spergon was 82%

For the complete facts and figures we refer you to the Pea Seed Treatment portion of report of the Coordination in Seed Treatment Research Committee, American Phytopathological Society, given Dec. 31, 1941, at Dallas, Texas.

From these impartial Experiment Station tests it would seem that Spergon exceeds even our own claims for it . . . which are as follows:

★ ★ ★ ★ ★ ★

1. EASIER. One chemical treats vegetables and flower seeds.

2. SAFER. Widespread experiments indicate Spergon is harmless to delicate seeds and plants, including peas and beans (notably LIMAS). Safer for people too: Spergon is a true *organic* chemical, containing no poisonous metallic substances.

3. WORKS IN ANY TYPE OF SOIL. Contains a powerful "buffer" against the weakening effect of soil chemicals.

4. SURER. Better protection against "damping-off" and seed decay. Attacks both seed-borne and soil-borne fungi harmful to germination.

5. SELF-LUBRICATING. On peas, for example, no graphite is needed to help seed through the drill.

6. LONGER-LASTING. A very fine powder with unusual adhering power — coats seeds evenly, completely, lastingly. So stable, seeds can be treated months before planting.

7. COMPATIBILITY WITH INOCULATION. Legume Bacteria may be used with Spergon-treated seed with benefits from both treatments.

8. ECONOMICAL. Assurance of high yield pays for treatment many times over.

TYPICAL DOSAGES:

Corn	1½ oz.	Spergon per bu. seed
Peas	2 "	" " " "
Beans	2 "	" " " "
Sugar Beet	3 "	" " " "
Lettuce	6 "	" " " "
Spinach	4 "	" " " "
Melons	3 "	" " " "

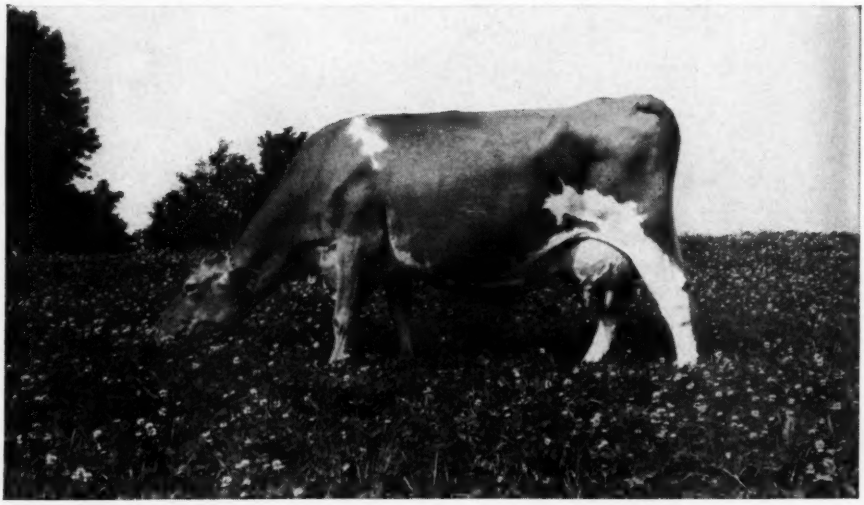
NO, SPERGON IS NOT RUBBER and not a rubber by-product. It is a pure organic chemical developed especially for use in agriculture. The *Naugatuck Chemical Division* of United States Rubber Company manufactures basic chemicals for many other industries.

For further information about Spergon, and distributors' names, write

UNITED STATES RUBBER COMPANY

NAUGATUCK CHEMICAL DIVISION
1230 Sixth Ave, New York, N.Y.

FERTILIZER *Films* AVAILABLE



Well-fertilized Ladino clover pastures mean greater milk and beef production for Victory

Two LADINO CLOVER PASTURE FILMS

"In the Clover"

A motion picture depicting the value, uses, and fertilizer requirements of Ladino clover in ***Northeastern*** agriculture.

16mm., silent, color, running time 45 min. (on 400-ft. reels).

"Ladino Clover Pastures"

Shows proper fertilization for best use of Ladino clover by beef and dairy cattle, sheep, and poultry in the ***West.***

16mm., silent, color, running time 25 min. (on 400-ft. reels).

Other 16MM. COLOR FILMS AVAILABLE

Potash in Southern Agriculture
Potash Production in America
Bringing Citrus Quality to Market
Machine Placement of Fertilizer
Potash from Soil to Plant
Potash Deficiency in Grapes and Prunes
New Soils from Old

We shall be pleased to loan any of these films to agricultural colleges and experiment stations, county agricultural agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

MAKE YOUR FALL REQUESTS NOW

AMERICAN POTASH INSTITUTE, INC.

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